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# WESTERN ELECTRICIAN

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## PROGRESS.

Development and advancement along commercial lines are the most striking characteristics of the present electrical era. Recognizing this fact the publishers of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN have purchased ELECTROCRAFT, the journal that had become the recognized exponent of the electrical construction and supply fields.

Three years ago the publishers of the ELECTRICAL REVIEW announced the purchase of the WESTERN ELECTRICIAN and the consolidation of these two well established and influential electrical weeklies. The motive behind this purchase was the recognition of a greater opportunity to serve the rapidly growing industry through the combined resources of the separate publications. ELECTROCRAFT is now made a part of this progressive publishing policy, bringing to the consolidated weekly many thousand subscribers from its important field.

During recent years the electrical industry has seen a development in two directions that today assumes vast proportions. The one is the establishment of the commercial or selling department of the central station, and the other the tremendous increase in electrical construction, due to the more general use of electrical energy and the installation of numberless new current-consuming devices.

It becomes expedient and thoroughly practical, therefore, to render to the electrical field a timely service that will be at once comprehensive and indispensable. It is highly important that the alert manager of the central station be in the closest touch with those ideas and suggestions that will put new consumers on his circuits. It is just as necessary that he become expert in the sale as in the economical production of electrical energy. It will be the policy of this journal to publish information that the selling organization of the central station can make of immediate practical application to its own problems. It will make a comprehensive study of the opportunities in every industry for the greater use of electricity for every kind of service. It will present specific examples of the advantages of electricity wherever it can be employed, and describe the most successful methods of introducing such applications.

In the electrical construction field the work done by

**ELECTROCRAFT will be greatly enlarged. The services of the publisher whose energy and understanding of the particular needs of the field were responsible for the great success made by ELECTROCRAFT, have been retained. Ample resources and facilities are now provided for the carrying out of this work.**

**Augmenting this journal's widened scope as a medium of practical information, a complete buyers' reference of electrical material will be published.**

**These features, supplementing the qualities that have marked the continued advance of this journal for the past thirty years, make the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, in value to its readers and in service to its advertisers, the indispensable electrical weekly.**

## ELECTRIC-VEHICLE SELECTION AN ENGINEERING PROBLEM.

It is the boast of most manufacturers of electrical appliances designed for rough and ready use by the layman that the purchaser cannot go far astray if he buys any standard size of marketed apparatus and attaches it to his circuit without other formality than a close adherence to the local wiring regulations. Strenuous efforts have been made to keep down the watt consumption of numerous small devices which testify to the almost infinite convenience of electricity in daily life, and as a result, an extraordinarily long list would be needed to cover even a representative assortment of devices which may be placed in instant service by the simple expedient of screwing a plug into a lamp socket. When one enters the field of specialized motor application, however, and particularly that branch of it included in the operation of direct-connected mechanisms calling for the expenditure of considerable power, it no longer suffices to buy the equipment off-hand. Self-evident as this would perhaps appear, it is the basis upon which not a little electric-vehicle salesmanship has in the past proceeded, and with the natural result that the performance of the apparatus has sometimes been seriously discredited and the whole electric-vehicle industry given an undeserved reputation for unreliability, high depreciation and large cost of operation and maintenance.

The selection of electric vehicles is a genuine engineering problem, and that this is so, is well testified by the action of prominent motor manufacturing interests in refusing to bid on motors for this class of service unless preliminary data sheets have first been filled by the intending purchaser or an authorized engineering representative. Thus, information is demanded as to the carrying capacity of the proposed vehicle, length of wheel base, diameter of driving wheels, size and type of tires, number of motors wanted, gear reduction, use of electric brake points in the controller, number of speeds forward, reversing requirements, type of battery to be used, number of cells, normal speed and maximum speed required on level asphalt, and the number of miles required per charge at the normal speed. Additional information is also sought upon the character and average condition of the roads to be regularly traversed, and when practicable, estimates of energy consumption at both normal and maximum speeds on the level are required. Well organized battery manufacturers require precisely this type of information, and in addition, the sales engineer asks for as much detail as possible concerning the routing of the pleasure car or truck, and its daily performance in relation to local charging and maintenance facilities.

Procedure along these lines means hard work before a contract for electric-vehicle equipment is signed on the permanently satisfactory foundation of an adequate technical investigation. Too few manufacturers as yet recognize the importance of approaching these questions of sale and service requirement in a thoroughly scientific way. Where such a course is followed, however, the manufacturer finds himself in possession of very valuable data in case a complaint is later received as to the ability of the car to perform a given task. Not only can he thus protect his own position and the reputation of his product throughout perhaps an entire industry, but he can also check the service requirements, costs and operating capabilities of his machinery much more closely than where the old haphazard selling methods were followed. Looking far into the tendencies of the electric-vehicle field, one finds good cause for congratulation that the old hasty methods of application are passing away in favor of a sound engineering determination of service requirements.

## GOING VALUE.

The question of determining rates is perhaps the most important which comes before the various public-utility commissions. This can only be done after a thorough investigation into the value of the property concerned. It is always conceded that the public utility is entitled to charge rates which shall be sufficient, after providing for operating expenses and depreciation, to pay interest charges upon the investment. After a proper determination of the interest charges it is usually easy to decide what is the maximum rate which the utility should be permitted to charge. If for any reason, such as the encouragement of traffic and the extension of business, the managers of the utility prefer to charge less than this maximum rate without discrimination to any of its patrons, this is usually permissible, but it is not permitted to charge more than the maximum rate which may be arrived at by consideration of the above mentioned items. In determining the fixed charges trouble usually arises through a disagreement among the various parties concerned, both as to what is a proper rate of return upon the investment and as to what money value should be assigned to the investment itself. Various methods of making an appraisal of the property of a public-service corporation have been proposed and used, and it will not be necessary to enumerate these at this time. In addition, however, to the

appraisal of the physical value of any operating utility, it is generally conceded that there are other elements of value in the property of a less tangible nature. Part of these intangible values represent an expenditure of capital in the organization of the business, while others represent values which have come into the possession of the utility during the conduct of its business, but without any direct or definite financial outlay.

Examples of definite charges which have had to be met, but which are not represented in physical property, are the legal expenses of incorporation, overhead expenses connected with the promotion and construction of the enterprise, and interest on capital which has been lying idle during the construction period. Even after the enterprise is in operation, expenses are often incurred in developing new business which are too great to be regarded as operating expenses and which it is not fair to charge as operating expenses against the first year, because the good results of this expenditure may be spread over the entire life of the utility. At least part of the expenditure for the development of new business may therefore be regarded as a legitimate investment which may be capitalized and permitted to receive an annual return. In the early years of operation very few utilities had sufficient business to make them paying propositions. To attempt to charge enough for service to cover the operating expenses and legitimate fixed charges would mean that the rate would be prohibitive and business would not be developed. It is consequently good management to operate for a short time at rates which, with the existing volume of business, do not bring in sufficient income. It is very probable, therefore, that dividends will not be paid during the early years. Where proper fixed charges have for this reason not been met, it seems proper in the later determination of rates to regard this forfeiture of fixed charges by the persons entitled to them as an additional investment in the utility and that this capitalized value may properly be recognized as entitled to receive returns as soon as the business reaches a paying basis. Where this is done it is only proper, on the other hand, to balance against this deferred interest any excessive dividends which have been realized later.

The propriety of recognizing such elements as illustrated above in fixing rates has been admitted both by the courts and by public-utility commissions, and in some cases such allowances have been classified as constituting going value. The use of the term "going value" has been applied to such a variety of elements which enter into intangible values of a business that its meaning has been somewhat clouded. For instance, it has been used by certain writers in connection with such elements as those mentioned above, namely, development expenses and the capitalization of deferred interest payments. One definition which has been given for this term is "the value of a created income." This definition, if applied to a private business, would require it to cover income which may have been received through the influence of good will, of excessive charges, and of various other elements which cannot be conceded to deserve recognition in the case of a public utility. Incomes, both private and public-utility, have often been built up upon the basis of excessive charges. If going value is to mean the capitalization of such an income, and if this value is to be recognized as a legitimate basis for fixed charges in the future, it would mean that no rate, however high, could ever be reduced by the public-service commission.

Another definition of going value has been recognized which is not included under any of the above meanings of the term. If we consider a public utility which has been existing in a community for a term of years and compare it with a hypothetical utility company which should be started up in the same community at the time that the first ceased to do business, it is evident that it would require a certain time, even after the new utility is prepared to do business, before it could make contracts with all the individuals desiring its services and get its business into full operation, so that its gross receipts would equal those of the old utility company. The hypothesis may include an assumption that the value of the physical property and development expenses are the same as that of the old company, that the operating expenses are also the same, and that eventually the same customers and the same amount of business would be secured. This involves then the assumption that the rates and fixed charges will also be the same. It is evident that during the period which is required by the new company to adjust itself to the conditions, and to getting its business in full operation, there will be a deficit due to the fact that it is not operating at its ultimate load. In other words, there is a loss involved, as compared with a company in full operation, due to setting the business going. When the business has been set going this constitutes an asset which is the property of the utility. Such a value seems to represent what the name "going value" should be applied to from the literal meaning of the words. It is then a question whether this involves any further element which should enter into rate-making, other than those which come under the considerations of deferred interest and new-business development.

Since "going value" has been used in so many senses and is so differently defined by different persons, it must be regarded as an unfortunate term and one which it would be well to avoid. Any assets which may be included in good will, the value of a franchise, the capitalization of deferred interest payments, the cost of developing new business, etc., should be treated under their own heads and upon their own merits.

The indefinite, obscure and confusing term "going value" could then easily be dispensed with and any intangible assets which may exist could more correctly be treated by associating them with some tangible ideas.

### Transportation Arrangements for the Seattle Convention.

A meeting of the Transportation Committee was held at the headquarters of the National Electric Light Association in New York City, November 22, at which the following members were present: C. H. Hodskinson, chairman; G. W. Elliott, G. A. Freeman, F. H. Gale, W. J. Grambs, A. H. Manwaring, D. H. McDougall, J. C. McQuiston, J. B. Eaton and C. B. Burleigh. President Gilchrist and Secretary Martin attended the meeting as members *ex-officio*. The chairman announced that the Transcontinental Passenger Association had authorized reduced round-trip fares on account of the Seattle meeting, as follows: from Chicago, $65; from St. Louis, $62.50; from Missouri Gateways (Omaha to Kansas City, inclusive), $55; from St. Paul, $55. Dates of sale for tickets under reduced fares are authorized, as follows: May 27 and 28 and June 3 to 6, inclusive; final return limit, July 27, 1912. Application has been made to the Eastern Passenger Associations for a fare and a half to the gateways of the Transcontinental Passenger Association, and as soon as an official tender is received from these associations, complete details regarding the cost of transportation to the convention will be announced by the Transportation Committee.

Details regarding special tours to Seattle were discussed and plans were formulated for several different tours, one of which is a *tour de luxe* embracing all the scenic wonders of the West. Another tour calls for direct travel to Seattle with choice of returning routes to suit delegates. A third tour calls for a fast schedule from the Atlantic seaboard to Seattle and return, for the benefit of members of the Association whose time is limited.

The committee is making a special effort this year to make the trip to the convention the most elaborate, comfortable and interesting that has ever been afforded to the members of the Association.

The committee was most fortunate in having in attendance W. J. Grambs, of Seattle, who came all the way to participate in the conference. Mr. Grambs has accepted the heavy responsibility of making all the arrangements on the Pacific Coast for the comfortable return of the members after the convention to their respective destinations, if they have not made arrangements for the special trains. At Seattle the Transportation Committee will have an elaborate suite of fully equipped offices in the Convention building with representatives of every railroad entering Seattle in attendance.

### Dormant Possibilities in Electrical Engineering.

The Schenectady Section of the American Institute of Electrical Engineers held its first regular meeting for the season on November 8, at which time Henry M. Hobart, consulting engineer of the General Electric Company, read a paper on "Some Simple Dormant Possibilities in Electrical Engineering."

Some of the points discussed by Mr. Hobart are as follows:

The increasing use of induction generators and motors for very high speeds, calling attention to the difficulties encountered in the design of sixty-cycle steam-turbo-driven synchronous generators above 3000 or 4000 kilowatt output. These difficulties are greatly modified with induction generators.

The increasing use of synchronous generator and motors for low speeds, showing that they were inherently low-speed machines, while induction generators and motors similarly are high-speed machines.

The advantages of winding generators for low voltage and employing step-up transformers between generators and transmission line or cable system. This is the outgrowth of the successful manufacture of cables for voltages above 11,000 volts and the difficulties of insulation and mechanical support of end connections in high-voltage generators.

Prospect and advantages of employing sixty-cycle static rectifier substations instead of twenty-five-cycle rotary-converter substations for electric-railway propositions, bring in the feasibility of using sixty-cycle transmission.

Possibilities of decreasing the capital cost and at the same time improving the all-year efficiency of rotary-converter substations by increasing the average load on the rotary per rated horsepower.

Improved methods of cooling electric machinery by use of ducts parallel to the shaft through the core, through which air can be forced which carries a large quantity of water in suspension, *i. e.*, fog.

The advantages from the use of the internal-combustion engine for isolated plants in contrast with the present practice of large centralized plants with the unavoidable preponderating layout of capital for transmission.

Gasoline-electric propulsion.

The electric propulsion of ships.

Mr. Hobart's paper was very interesting and was fully discussed.

### Recommend Appropriation for Bureau of Mines.

In the general estimates for appropriations for the fiscal year 1912, which begins July 1, 1912, Secretary of the Interior Walter L. Fisher has recommended for the investigation as to the causes of mine explosions, methods of mining, especially in relation to the safety of miners, the appliances best adapted to prevent accidents, the possible improvement of conditions under which mining operations are carried on, the use of explosives and electricity, the prevention of accidents, and other inquiries and technologic investigations pertinent to the mining industry, $360,000.

### Los Angeles Section A. I. E. E.

At the regular monthly meeting of the Los Angeles Section of the American Institute of Electrical Engineers to be held in December there will be a "Public Service Discussion," relating to conditions of service and rates. T. B. Comstock, engineer of the Board of Public Utilities, Los Angeles, and Paul Shoup, vice-president and general manager of the Pacific Electric Railway Company, will make addresses.

### Safety Devices Installed at University of Illinois.

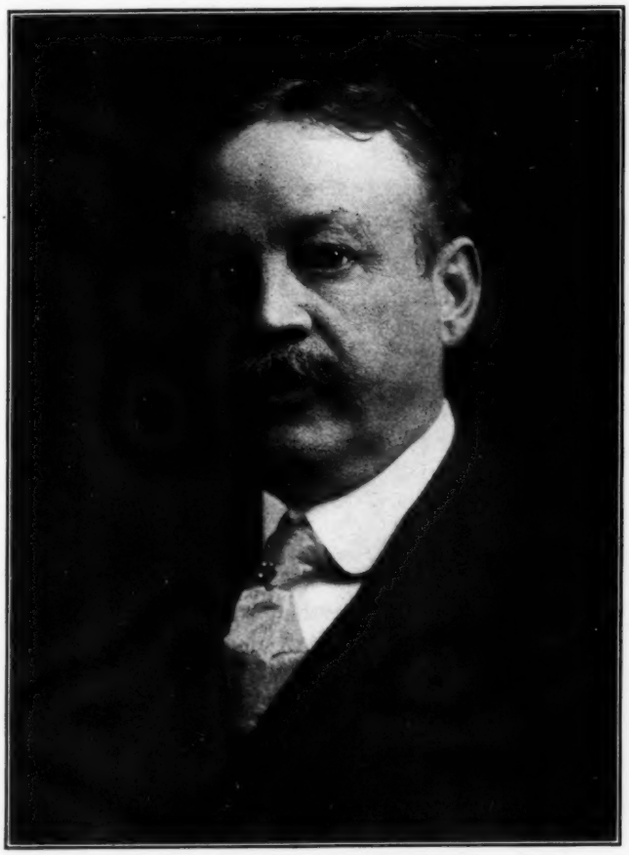
All the wood-working machinery of the shops of the University of Illinois has been equipped with safety devices. The object of the equipment is not only to safeguard the students and employees, but also to furnish an exhibit of the most improved forms of such safety devices. Several of the safety devices have been designed and built in the shops.

### Oregon Contractors Organize.

Oregon members of the National Electrical Contractors' Association are arranging for the establishment of a state association. Fred D. Webber, state electrical inspector, acting as chairman, has appointed committees to draw up a constitution and bylaws.

### Charles Selden.

The electric telegraph, the earliest commercial application of the utilization of electrical energy, aside from its dominant position as an agency for the swift communication of intelligence over great distances, has always been a highly important adjunct of railway operation. Many of the great men of the day in railway circles began their careers as telegraph operators and many of the notable figures of the electrical industry today have also drifted into and out of railway service at some time in their careers. The subject of this sketch, Charles Selden, began his active commercial life as a messenger boy in Leavenworth, Kans., with the Morris & Stebbins Telegraph Company, operating a line extending from Omaha to St. Louis. He left Leavenworth then to attend school in New York State, remaining there four and one-half years at what was known as Fergusonville Academy in Delaware County. He then went to Hamilton, O., to live, and in 1866 took up the study of telegraphy for three months at the depot of the Cincinnati, Hamilton & Dayton Railroad, at Hamilton, and was later appointed operator on the Cincinnati & Indianapolis Junction Railroad at Connorsville, Ind. Remaining there a few months he was transferred to Cambridge, Ind., on the same road, and was made clerk of the shops and train dispatcher. In 1867 he again entered the service of the Cincinnati, Hamilton & Dayton Railroad at Middletown, O., and later at Dayton.



CHARLES SELDEN,
General Inspector of Transportation, Baltimore & Ohio Railroad.

In 1868 he entered the main office of the Western Union Telegraph Company at Cincinnati, and in 1871 was made assistant night manager, afterwards assistant day chief operator.

In 1876 he was transferred to Toledo, Ohio, in charge of the quadruplex repeaters on the through circuits between Chicago and the East.

In 1879 Mr. Selden left the Western Union service to build the Bell Telephone Company exchange in opposition to the Edison Company at Toledo, Ohio, and was superintendent up to 1880. At one time this company had the largest exchange out of New York City, except Buffalo. Before he left the Bell Company, it had absorbed the Edison Company, leaving the field entirely in the former company's hands.

In 1880 he was made superintendent of the American Union Telegraph Company for territory extending from Pittsburgh to Danville, Ill., from Detroit to Dayton, and from Toledo to South Bend, Ind., constructing lines throughout that district.

After the consolidation of the Western Union and the American Union Telegraph Companies he was made superintendent of telegraph of the Wabash Railroad system with headquarters at St. Louis, and while acting in that capacity he became interested with friends in the Missouri & Kansas Telephone Company, serving during its early days as one of its directors.

Mr. Selden remained with the Wabash until 1884, when he went with the Baltimore & Ohio Railroad at Baltimore, which company was then engaged in commercial telegraph business, and Mr. Selden was in charge of the lines of the Baltimore & Ohio and contiguous territory for the commercial department. Three years later, in 1887, when the Baltimore & Ohio consolidated with the Western Union lines, he became joint superintendent of telegraph for the two companies. The superintendent of telegraph of the Baltimore & Ohio always had jurisdiction to a certain extent over the train dispatching and the train dispatchers' work, and his transportation duties were in the character of assistant to the general manager. In 1911 it was deemed best to create an office to be held jointly by the superintendent of telegraph that would carry a title and an authority to instruct in certain matters pertaining to the movement of trains and the compiling and interpretation of train rules, and the office of General Inspector of Transportation was therefore established. As the office carried with it the supervision of all rules for the operating department of the railroad, including those on the time tables, the examination of train dispatchers and supervising of train movements on various divisions, the importance of this position is obvious.

Mr. Selden by training and temperament is preeminently fitted for this position and it is a matter that this great system may be congratulated upon that when the opportunity pressed for the man to do the work a fitting incumbent was so readily at hand.

### Steel-Wire Gauges.

Upon the recommendation of the Bureau of Standards, a number of the principal wire manufacturers and others have agreed to designate the customary gauges of steel wire by the term "steel wire gauge." This gauge is different from that used in England, and in cases where it is necessary to distinguish between the two it will be called the United States steel wire gauge. The name thus adopted has no legal authority, but has official sanction. This gauge is the same as the Washburn and Moen gauge and is that which has been in use heretofore by the American Steel & Wire Company and other manufacturers.

In connection with importations of wire the Treasury Department makes use of the Birmingham wire gauge, since this has been specified in the Acts of Congress dealing with the tariff. It is, however, nearly obsolete both in this country and in Great Britain.

Wires of other metals such as copper will continue to be designated by the well known Brown & Sharpe gauge, otherwise known as the American wire gauge.

### Activities of Philadelphia Company Section.

The Philadelphia Electric Company Section of the National Electric Light Association has been holding a series of interesting meetings during November.

On Thursday, November 2, The Comedy Company of the Accounting Department Branch cut loose from staid Quaker ways and the theories of higher accounting, and presented the comedy farce "Her Gloves" to an appreciative audience of more than 500 persons. A dance followed and was a very enjoyable part of the evening's entertainment.

The meeting of the Commercial Branch was an interesting one, and the subject "Salesmanship from an Insurance Man's Standpoint," was ably presented by Frederick C. Jones, of the Equitable Life Assurance Company. Mr. Jones called attention to many points of similarity in the work of the insurance man and the light and power salesman, indicating methods of approach, and the necessity of studying the prospect not only from a business point but also of becoming thoroughly familiar with his individual habits, as a means of securing that first attention which means so much in salesmanship.

The Meter Department Branch met on November 3, and John V. Matthews, taking as his subject, "Three-Phase Systems and the Measurement of Power," presented a paper that evidenced much care and research in the preparation. Economy of operation and theory of distribution were thoroughly covered.

The regular meeting of the Accounting Department Branch was largely attended and Byron B. Smith's paper "Accounting for Purchases" was most instructive, making clear the importance of co-operation on the part of all who in any way become involved in the using of material, to the end that job and store-house records may be accurately kept, and that all may be traced through the accounting records. Mr. Smith convinced his hearers that departmental whims and "red tape" are not carried beyond the point of necessary information.

The November general meeting of the Section was held on November 20, when Charles P. Steinmetz made an address. Previous to the meeting Dr. Steinmetz was entertained at an informal dinner, about sixty members and guests attending.

The subject, "The Effect of Reactance on Alternating-Current Circuits and Apparatus," was expounded. Discussion of the paper was participated in by H. C. Snook and A. R. Cheyney.

At the December meeting, A. H. Armstrong will address the Section on "The Coming of the Electric Locomotive."

### Further Census Data on Manufacture of Electrical Machinery, Apparatus and Supplies, in 1900.

A further preliminary statement[1] of the general results of the Thirteenth United States Census of establishments engaged in the manufacture of electrical machinery, apparatus, and supplies was issued on November 28, by Director Durand, of the Bureau of the Census, Department of Commerce and Labor. The manufacture includes dynamos and dynamotors, transformers, motors, storage and primary batteries, arc and incandescent lamps, searchlights, transmitters and receivers, rheostats and resistances, electric welding and therapeutic apparatus, electric switches, signals and attachments, and similar machinery, apparatus and supplies. The report contains a summary which gives the general figures for 1904 and 1909.

The general summary shows increases in all the items at the census of 1909 as compared with that for 1904.

There were 1,009 establishments engaged in this industry in 1909 and 784 in 1904, an increase of 29 per cent.

The capital invested as reported in 1909 was $267,844,000, a gain of $93,778,000, or 54 per cent, over $174,066,000 in 1904. The average capital per establishment was approximately $265,000 in 1909 and $222,000 in 1904.

The value of products was $221,309,000 in 1909 and $140,809,000 in 1904, an increase of $80,500,000, or 57 per cent. The average per establishment was approximately $219,000 in 1909 and $180,000 in 1904.

1 See previous statements in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of September 9, 1911, page 517, and October 28, 1911, page 870.

The cost of materials used was $108,566,000 in 1909, as against $66,837,000 in 1904, an increase of $41,729,000.

The value added by manufacture was $112,743,000 in 1909 and $73,972,000 in 1904, an increase of $38,771,000, or 52 per cent. This item formed 51 per cent of the total value of products in 1909 and 53 per cent in 1904. The value added by manufacture represents the difference between the cost of materials used and the value of products after the manufacturing processes have been expended upon them. It is the best measure of the relative importance of industries.

A comparative summary follows, giving the general statistics for the industry, 1909 and 1904.

ELECTRICAL MACHINERY, APPARATUS AND SUPPLIES—GENERAL SUMMARY.

| | Census— 1909. | 1904. | Per Cent of Increase, 1904-1909. |
|---|---|---|---|
| Number of establishments | 1,009 | 784 | 29 |
| Capital | $267,844,000 | $174,066,000 | 54 |
| Cost of materials used | 108,566,000 | 66,837,000 | 62 |
| Salaries and wages | 69,574,000 | 42,933,000 | 62 |
| Salaries | 20,193,000 | 11,091,000 | 82 |
| Wages | 49,381,000 | 31,842,000 | 55 |
| Miscellaneous expenses | 23,630,000 | 17,949,000 | 32 |
| Value of products | 221,309,000 | 140,809,000 | 57 |
| Value added by manufacture (products less cost of materials) | 112,743,000 | 73,972,000 | 52 |
| Employees: | | | |
| Number of salaried officials and clerks | 17,905 | 10,619 | 69 |
| Average number of wage earners employed during the year. | 87,256 | 60,466 | 44 |
| Primary horsepower | 158,768 | 105,376 | 51 |

### Portland, Me., to Have Ornamental Tungsten-Cluster Lighting.

Both branches of the City Council of Portland, Me., have adopted a plan proposed by the Retail Merchants' Association for the ornamental lighting of a large part of the business district of the city. The first installation will be made on Congress Street from Market Street to Longfellow Square and on Middle Street from Market Street to Monument Square. Each post will be of a design similar to the group of cluster posts now in use at Monument Square, four 100-watt tungsten lamps being mounted on each post. The present installation along the two streets affected consists of arc lamps and one, two and four-mantle gas lamps. The new posts will be arranged to accommodate the trolley wires of the Portland Railroad Company. It is expected that the installation will gradually be extended to other adjoining streets. The cost of each new cluster post has been estimated at $60 per year.

# New Hydroelectric Development in Canada.

## City of Winnipeg Completes Comprehensive Municipal System.

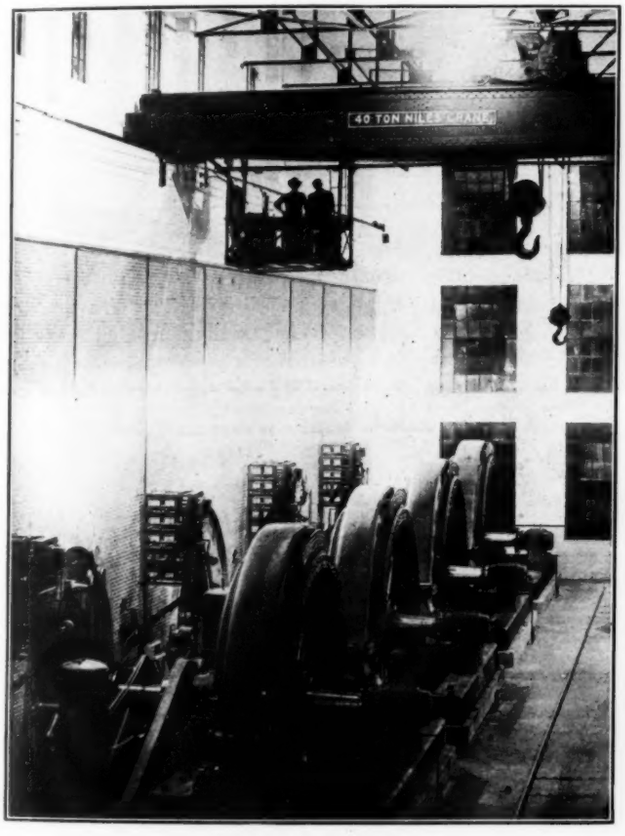
BY EDGAR GUY.

In 1905 the citizens of Winnipeg, dissatisfied with the prices charged for power and light, decided to create competition by building a municipal plant. With this end in view, they engaged a firm of engineers to make a report on the available sources of hydroelectric power on the Winnipeg River. A careful study of the hydraulic resources of the river was made, as a result of which the site at Point du Bois was chosen and estimates made of the cost of the work. A report was submitted to the City Council resulting in a by-law being submitted to the electors who by a large majority heartily indorsed the proposition.

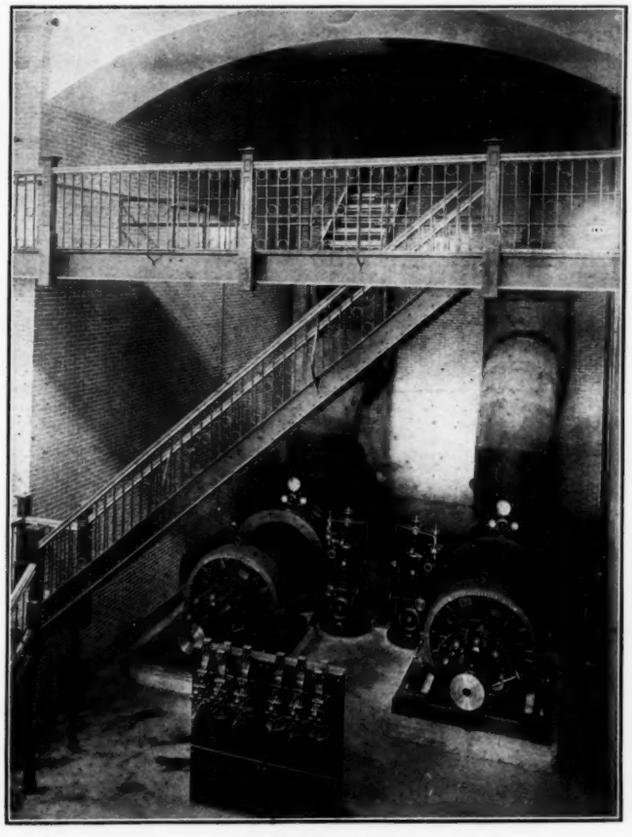
In October, 1906, designs were begun and tenders were called for, but owing to the financial stringency existing at that time, the scheme was postponed. In the meantime, however, small sums of money had been appropriated for the building of a short length of tramway extending from Lac du Bonnet, the terminus of the Canadian Pacific Railway, to Point du Bois, the site of the plant, a distance of about twenty-six miles. In 1908 this line of railway having been completed and the financial clouds having cleared away, a start was made by awarding the contract for the construction of the plant and the erection of the transmission line. Since this time the work has been pushed continuously and the plant is now in operation.

The Winnipeg River drains an area of about 52,000 square miles, the country being of the Laurentian character covered with forests, which have so far been untouched by lumbermen. The basin is made up of countless lakes, marshes, swamps and muskeg, with the result that the river presents ideal conditions for development due to its rocky formation and uniform conditions of flow. The fall of the river from its mouth to its source in the Rainy River district is 347 feet, of which 185 feet are available for the development of energy in territory contiguous to Winnipeg.

The Point du Bois Falls formerly had a natural fall of about thirty feet, which is now increased by the development to forty-five feet through damming the river and drowning out Lamprey Falls, eight miles above. The minimum flow of the river here is about 16,000 cubic feet per second, corresponding to a development of approximately 60,000 horsepower for twenty-four hours. The hydraulic features of the development have been designed for this amount, but the machinery at present installed will develop only 26,000 horsepower. A plat of the development is shown on the next page.




GENERATOR ROOM.



TURBINE ROOM.

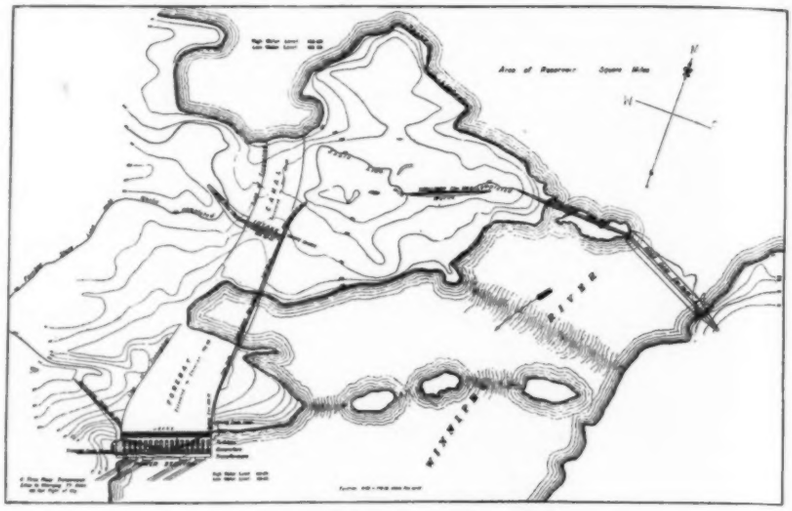
Briefly the plan has been to dam the river by means of a concrete spillway and a rock-fill dam taking advantage of the islands and shoals in the river. As this country is of a granite formation, no difficulty was experienced in finding good foundations. The water is diverted to the power house on the west side of the river by means of the dam leading into the forebay. This forebay is controlled from the intake and the water may be drained from it by using stop-logs, thus cutting off the water at the intake and opening the butterfly gate valve close to the power house.

The power house is built of concrete throughout, being about 250 feet long, 150 feet wide and 100 feet high. Herewith are typical sections that show the general arrangement of apparatus. The water enters the turbine room through racks built over an apron of reinforced concrete. Each turbine is in a separate pit of circular cross section, the separating walls being of heavily reinforced concrete. Each turbine can be entirely isolated from the others by utilizing either the stop-logs or the motor-operated head gates. The head gates are of steel framework sheathed with pine and running on rollers. They are opened or closed by means of a rack meshing into a floating pinion on a shaft operated from the room above by induction motors.

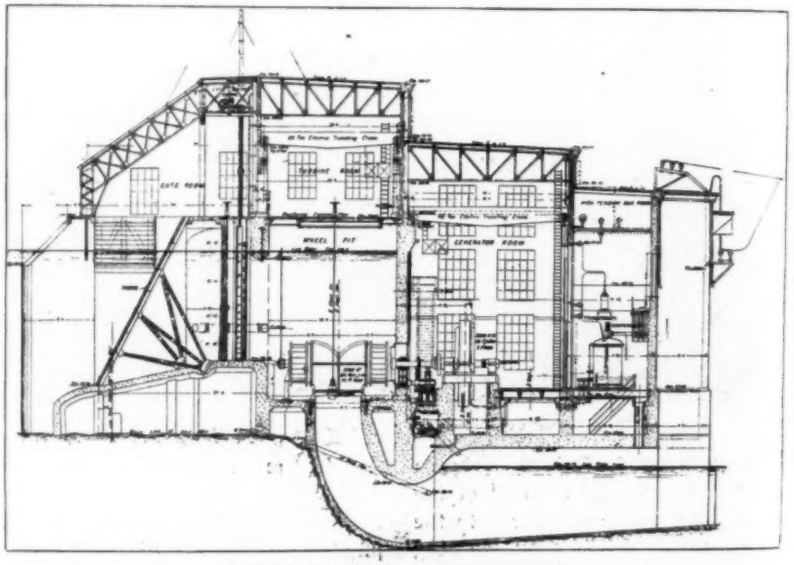
The turbines, five of which are now installed, are of the horizontal double-runner type, of a capacity of 5,200 horsepower under full gate, at 164 revolutions per minute, operating under a head of forty-five feet and using 1,250 cubic feet of water per second at maximum output. They develop their maximum efficiency at seven-eighths gate corresponding to a full load on the generators. The draft tubes are of concrete, circular in cross section and gradually increase in size towards the outlets, giving at the turbines a water velocity of eight feet per second while at the seal of the draft tube the velocity is only 3.3 feet per second. The manufacturers guarantee the maximum efficiency of the turbines to be at least eighty-five per cent. The front bearing has ring lubrication, but the middle and back bearings are fed with forced grease lubrication from the generator room. The governors controlling the turbines are placed between the generators and the wall separating the generators and the turbines.

Direct connected to the turbines are the generators of 3,000-kilovolt-amperes capacity at 6,600 volts, sixty cycles. The machines are very strongly built, the rotors being of cast steel with a one-piece rim and four-piece hub shrunk together with steel rings. The windings are of formed coils in open slots, three slots per pole. The guaranteed characteristics of the machines are 95.2-per cent efficiency at full load; 8.25-per-cent regulation at 100-per-cent power-factor; thirty-five degrees centigrade rise in temperature at full load and unity power-factor. The motor-operated generator rheostats and field switches are mounted on the wall above the governors. The exciter bus-bars run under the floor from the exciter switchboard to the different machines.

The exciters, two in number, occupy one bay in line with the turbines. These are water driven, of 250-kilowatts capacity at 125 volts, direct connected to turbines of 450-horsepower capacity. The exciter switchboard with its electrically operated switches is located in front of and close to the exciters. The voltage regulation is accomplished by means of a Tirrill regulator acting in conjunction with line-drop compensators.



PLAT OF WINNIPEG DEVELOPMENT.



SECTION THROUGH POWER STATION.

Running parallel with the generator room the full length of the building are the transformer compartments and the switching chambers. Each transformer is completely isolated in a sep-

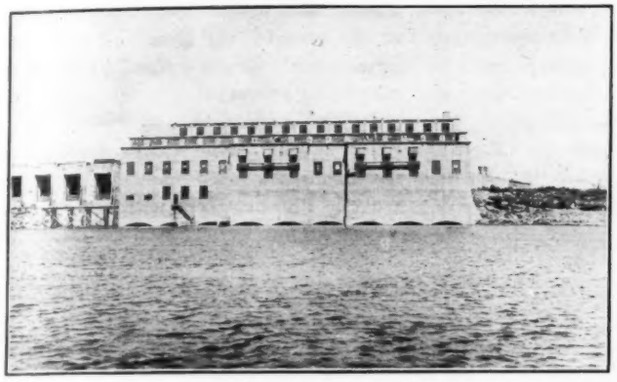
arate concrete fireproof compartment, three compartments with their transformers being grouped together. The low-tension switch rooms occupy alternate sections with the transformers, each bank of transformers being grouped with its corresponding bank of generators, and the switches controlling this apparatus.

each breaker being separated from the other by barriers of concrete.

The transformers are of the water-cooled, oil-insulated type of 3,000-kilowatts capacity, 6,600 to 66,000 volts, with provisions for five and ten-per-cent taps on the low-tension winding giving a variation of from 53,000 to 72,000 volts on the high-tension ter-

each transformer requires twelve gallons per minute to dissipate the heat generated. The transformers have an efficiency of 98.7 per cent at three-quarters and full load and 98.6 at one and one-quarter load.

Elaborate provisions have been made for the purification of the transformer oil. This apparatus consists of a num-



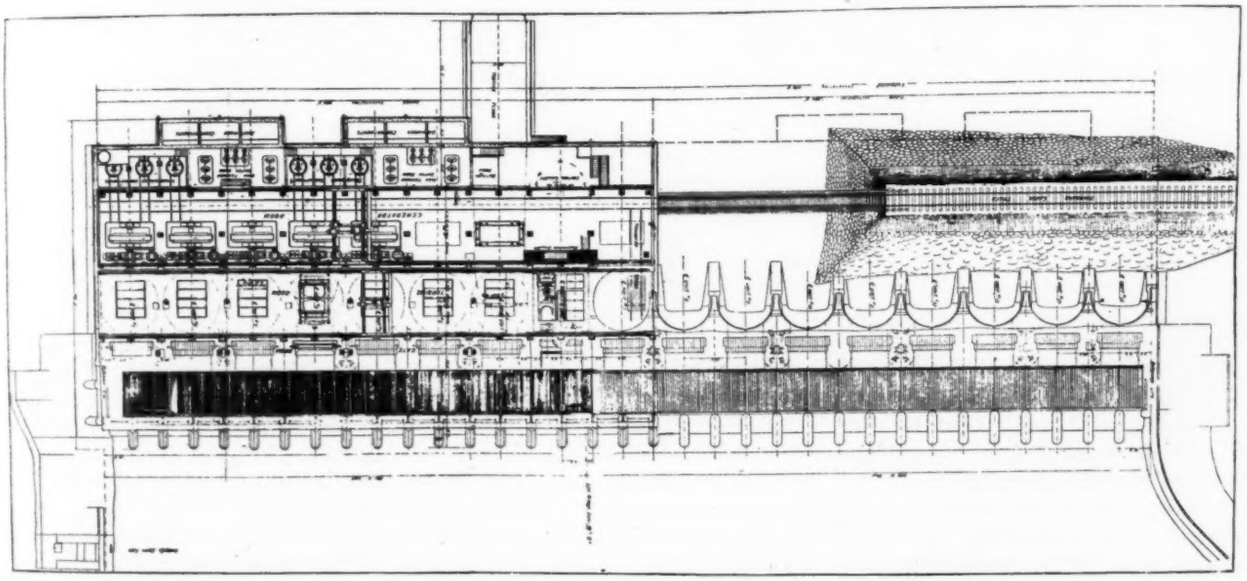
POWER HOUSE FROM TAILRACE.

POWER HOUSE FROM FOREBAY.

The switching has been arranged to handle three of the generators and three transformers as one unit although provision has been made for switching any generator or transformer to the other bank if necessary. The 6,600-volt busbars are in duplicate, the

minals. The transformers are connected in delta. The high-tension leads are brought out through the latest type of condenser bushing. The top of each transformer is fitted with a safety valve to ease the transformer in case of explosion. The cases are of boiler

ber of tanks, pumps, dehydrator and separator with the necessary piping, etc. Tanks are provided for the storage of both "good" and "bad" oil. When oil is to be treated, it is sent to the "bad" oil tanks from which, by passing through the dehydrator and



PLAN OF POWER HOUSE.

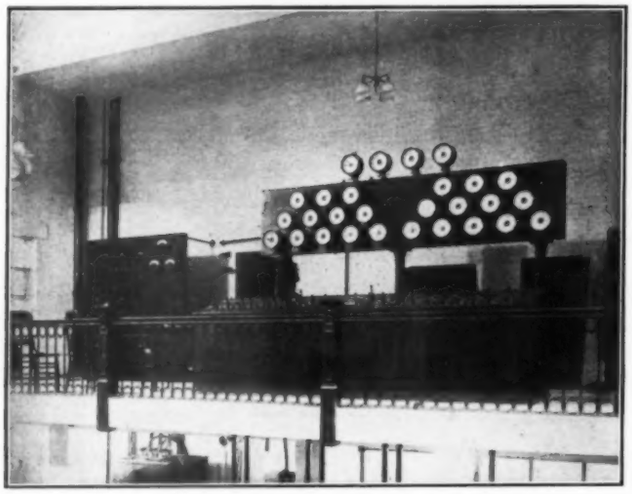
main and auxiliary busbars running along under the ceiling above the circuit-breakers. The phases are separated from each other by concrete barriers suspended from the ceiling. The oil circuit-breakers stand in a row in a concrete structure, each phase and

iron, heavy enough to withstand an internal pressure of fifty pounds per square inch. The cooling coils are of seamless brass tubing built to withstand a pressure of 250 pounds per square inch. The water for cooling purposes is piped from the forebay and

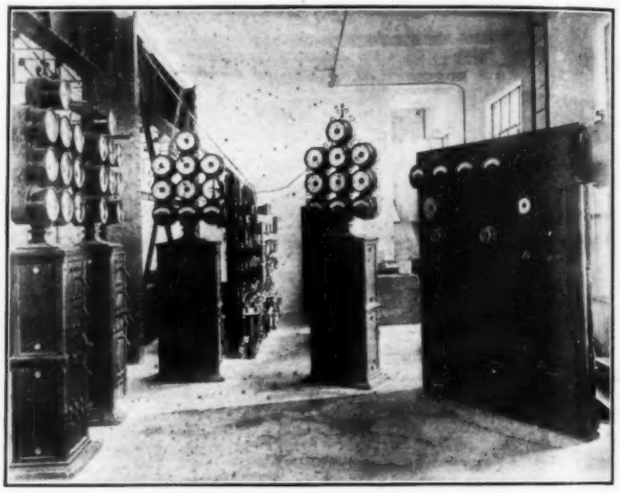
separator, it is purified and then stored in the "good" oil tanks in the basement or pumped to a large storage tank located above transformer No. 1. When moisture or any impurities such as carbonized oil are present in the oil, it is pumped through the dehydrator which

has separate compartments filled with unslaked lime and sand. The moisture present in the oil will be absorbed by the lime and all other impurities will be caught in the sand filter. Any other impurities escaping from the dehydrator will be taken care of by the separator which works on the principle of the well-known cream separator, the impurities being separated from the oil by centrifugal force.

The high-tension switches are located on the second floor immediately above the low-tension switch structure. In each of these rooms are the three 66,000-volt oil circuit-breakers, one controlling the line, one the transformer bank, while the third is the bus tie



MAIN CONTROL GALLERY.



ARRANGEMENT OF INSTRUMENT POSTS.

switch. Immediately above are the high-tension disconnecting switches with the high-tension bus bars of five-eighths inch copper tubing supported on insulators suspended from the walls or structural members. The minimum distance between phases for 66,000 volts is four feet, while the distance to ground is two feet three inches.

The control gallery is situated opposite the exciter bay in what is now the end of the building, but which, when the station is completed, will occupy the center of the building. The gallery is so located that an unobstructed view of the generator room may be obtained. Instrument posts carrying the indicating instruments are arranged in a semicircle with the exciter instrument board at the back. On the instrument posts are mounted the control switches with the red and green signal lamps. The posts are of two kinds, one having mounted thereon the control switches and instruments for one bank of generators, the other post having instruments and switches for the control of one line and one bank of transformers. An automatic synchronizing device and synchroscope are placed on the exciter instrument board with the control switches and instruments controlling the two exciters. On one side of this gallery is located the local-service switchboard controlling all the lighting, heating and power circuits in the building. One interesting feature is that the building will be electrically heated, the units being of five-kilowatt capacity at 225 volts. The lighting circuits are arranged so either alternating or direct current may be supplied. Alternating current is supplied from a 300-kilowatt 6,600-125-volt transformer and the direct-current from either the exciter or a storage battery.

This battery may be used either for emergency lighting or for the energizing of the direct-current control circuits. It has a rating of 120 ampere-hours and is controlled from a panel close to the exciter instrument board. The battery is made up of sixty-five cells, in each of which seven lead plates are immersed in the electrolyte.

All control and instrument leads before being distributed to the control and instrument apparatus, are collected and fused at the fuse board. Here are also mounted all the relays. A separate board is also supplied for recording instruments. For each transformer bank there are supplied one graphic voltmeter, one graphic wattmeter, one graphic ammeter and two graphic ammeters for the generators.

For the protection of the generators and transformers a double line of air-cooled choke coils have been installed, one set being located between the line and the line circuit-breaker and the other set are installed at the entrance of the transformers. Relays of the inverse-time-limit and reverse-current types, operative at no voltage, are used for the protection of the generators and the high-tension side of each transformer bank, while the low-tension side of the transformer bank and the high-tension lines are protected by inverse-time-limit relays.

Before leaving the building, each phase passes through a separate compartment in which are installed the electrolytic line arresters with their spark gaps which are set to take care of the ordinary surges on the line. If a direct lightning stroke strikes the line, it is taken care of by two sets of horn-gap arresters installed on the roof. These are used in combination with fuses and carborundum resistances. The lines leave the building through a Locke porcelain outlet bushing protected from the weather by hoods of reinforced concrete suspended from the side of the building, the line leaving through the open space at the bottom of the hood.

### TRANSMISSION LINE.

The transmission line is built over a special right of way 100 feet wide and is 77 miles long. It traverses a varied country of rock and muskeg in the eastern section and a prairie and well settled farming country towards Winnipeg. Four three-phase lines on two sets of double-circuit steel towers will be built for the final installation; the present equipment is made up of one

line of double-circuit steel towers on which are mounted two three-phase transmission lines and paralleling this one telephone line on wooden poles. In addition a patrol road twelve feet wide has been built from end to end, a considerable portion of which had to be corduroyed.

The telephone line consists of a single copper circuit of No. 12 copper carried on glass insulators attached to a single cross-arm. The wooden poles are spaced forty per mile. The line is ungrounded and is so located that when the second line of transmission towers is constructed, there will be about thirty feet between it and the nearest power wire. Transpositions are made four times per mile. Every mile there is a jack box where the patrolman may get in touch with the stations. A duplicate telephone line has been built from Lac du Bonnet to Point du Bois, on the same right of way as the tramway. From Lac du Bonnet to the city, the Canadian Pacific Railroad has a telegraph line built so there is a duplicate line of communication between the Point and the city.

Telephone booths are built along the line at intervals of five miles. Here is kept a full line of repairs for the transmission and telephone lines. A sleeping cot and a stove are provided in each of these booths, while a standard wall set is furnished with disconnecting switches for connecting to the telephone circuit and for isolating each end of that circuit if necessary. Patrol houses for men and stables for horses are at two intermediate points.

The standard line towers of the type known as "braced" are spaced 1,200 feet apart with an intermediate "flexible" tower half-way between used as a strut. These braced towers carry two three-phase aluminum circuits, the capacity of each circuit being 11,250 kilowatts. The wires of each circuit are spaced six feet apart and located on the points of an equilateral triangle.

The legs of braced towers shown in one of the illustrations are built of 3.5 by 3.5 by 0.25-inch angle iron braced with 2.5 by 2.5 by 0.1875-inch angles. In general the height of these towers is forty-two feet. They were tested at the shops of the manufacturers and successfully withstood 6,200 pounds applied to the end of the cross-arm, representing a load of 1,040 pounds per pin. At right angles to this a load of 1,200 pounds per pin was applied and only a very small deflection observed. The flexible tower is designed to withstand the same stress across the line, but will only stand about eighty pounds per pin in the direction of the line. It is built of six-inch channels for the upright, while the bracing is of the same character as the braced towers. For convenience in transportation the members were not all riveted together in the shop, the field riveting being accomplished by means of a portable gasoline-driven air-compressor set. After assembly the towers were painted with two coats of black paint. The lines crossing rivers and exposed points have as protection a ground wire running from tower to tower about ten feet above the top cables. The pin, of two-inch wrought-iron pipe, is intended to be the weakest member in the tower and is designed to withstand 900 pounds before breaking. On the heavier towers at the river crossings the pin is of solid cross section. The towers at the crossing of the Red River and Winnipeg River are 75 and 90 feet high respectively, with a span of 791 and 939 feet, and are much more strongly built so as to act as dead-ending towers.

INTERIOR OF TERMINAL RECEIVING STATION.

All towers are carefully grounded in dry ground by means of copper plates buried in coke and in moist ground by means of copper plates buried close to the footings. The footings of the towers are of concrete blocks eight feet high sunk seven feet in the ground. For muskeg, reinforced hollow blocks grouted in place upon piles were used. If the muskeg was too deep for piles, cribbing was used. On rock, the foundation bolts were set in deep and grouted in. As the muskeg country is usually impassable in summer, all materials had to be taken in during the winter on the ice and snow.

The conductors are of aluminum, nineteen strands, of 278,000 circular-mil cross section tested to withstand an elastic limit of 14,000 pounds and an ultimate strength of 24,000 to 29,000 pounds per square inch. The joints of eighteen-inch elliptical tubular sleeves and given three twists per joint have tested out to be as strong as the line itself. In stringing the conductors wooden rollers were fastened over the cross-arms of the towers and on these the cable was paid out, three conductors at a time.

The insulators are of the Locke No. 364 type, having four shells cemented together and on the inside a thimble of malleable iron into which is screwed the insulator pin. The diameter of the top shell is sixteen inches and the insulator is 13.5 inches high. The insulator withsfood factory tests 195,000 to 203,000 volts dry and 130,000 to 140,000 volts under a precipitation of one inch of water in four minutes.

The cable is tied to the insulators by means of approximately forty turns of No. 2 B. & S. soft-drawn aluminum wire on each side of the insulator. The wrapping is extended to this distance because if the arc jumps to ground over

the insulator, it is better to destroy the wrapping than the cable itself.

The line is divided into approximately three equal sections by two disconnecting switch towers. These towers are double structures made up of two standard-angle towers with connecting members with an insulated operating platform. The line is here dead-ended both ways and in the gap is placed a mechanically operated disconnecting switch so connected that the three phases are opened at the same time. The switches move in a horizontal plane through links connected to a lever arm, operated from below by a chain. Interconnections are also placed so that one line may be switched onto the other line in case of trouble, a means thereby being provided where one damaged section may be cut out without sacrificing continuity of service.

TERMINAL STATION.

The terminal receiving station is situated on the banks of the Red River, occupying the full block between Rachel and McFarlane Streets. This station receives the current at 60,000 volts and transforms it to 12,000, at which voltage it is distributed to different substations throughout the county by means of lead-covered cable in underground conduit. The present station is built to accommodate the equipment for two lines and three banks of transformers. Office space for the accommodation of the construction department has also been provided for. At present the equipment consists of six transformers, each of 2,700-kilovolt-amperes capacity with the necessary protective, switching and control apparatus.

The building is of pleasing appearance of red brick with white stone trimmings. It rests on concrete foundations built on piling. A spur track is laid into the building for the unloading of material. An electric travelling crane of twenty-five tons capacity facilitates the handling of material.

The lines enter the building from a dead-ending tower immediately in front of the station and pass from below into a reinforced-concrete hood and enter the building through a Locke outlet bushing into the discharger compartments where the electrolytic arresters are installed. Each arrester is in a separate fireproof compartment. The lines from here enter the high-tension switch room. Here are placed the high-tension circuit-breakers controlling the lines and transformers with one bus tie connecting the two lines. These breakers have each leg inclosed in an insulated tank of heavy steel. The breaking capacity of each breaker at 72,000 volts is 80,000 kilowatts. The leads are brought out through heavy bushings of the condenser type. There are two breaks under oil giving a breaking distance per pole of thirty-three inches. The contacts are self alining, each pair of two contacts having a heavy ring below the lower contact which is compressed when the circuit-breaker is closed.

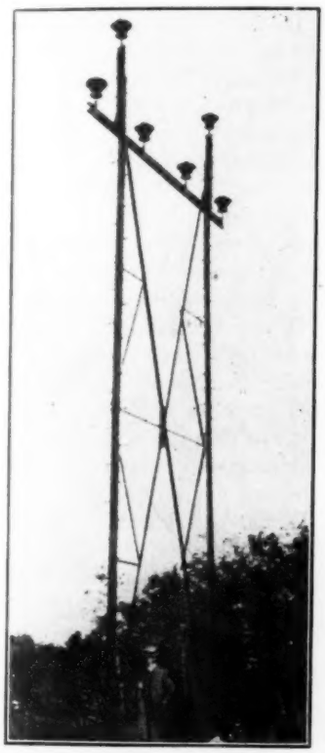
WINNIPEG TERMINAL RECEIVING STATION.

All high-tension wiring is exposed. It is held in place by insulators suspended from the walls or ceiling and in the center of the room by means of a light steel framework suspended from the steelwork in the roof. The transformer circuit-breakers are all provided with relays so in case of a short-circuit between the generating station and the terminal station on the line, the relay at the generating station will operate, as will the reverse-current relay on this line at the terminal station, due to power feeding back from the terminal-station busbars. In case the short-circuit is heavy and close to the terminal station, the relays on the other line will tend to open. To prevent this possibility, auxiliary relays and their mechanically operated switches are used in conjunction with each reverse-current relay, which under the above conditions, prevents the tripping of any line breaker except that on the defective line.

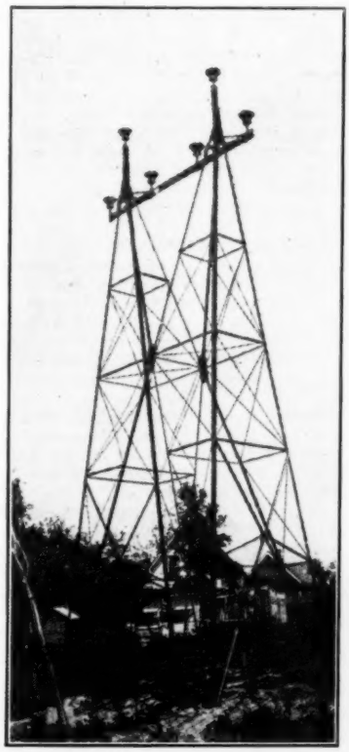
Close to the office section and located so the operator may have a comprehensive view of the high-tension room, is the control gallery where the bench board and indicating-instrument board are located. The bench board is of enamelled slate, on which are mounted the control switches and dummy busbars of polished copper, indicating connections through the station. The ammeter, voltmeter and frequency-meter receptacles are mounted on the top panels of the desk while the testing receptacles are mounted on the front vertical panels. The instrument board is of steel framework supported on ornamental cast-iron columns, and immediately back of the bench board. Under the control gallery are located the fuse and relay board and the recording-instrument board. On the latter are located the following recording instruments for each line: One alternating-current voltmeter; one power-factor meter; one polyphase wattmeter;

one integrating wattmeter, and one integrating wattmeter for each feeder.

An equipment for the testing of the insulation of materials is also installed in this room. It is of 200-kilovolt-amperes capacity and is made up of a testing transformer 2,200 to 180,000 volts; a regulating transformer 250 volts to 2,200 volts; a regulating switch of the drum type which with the regulating transformer will vary the voltage of the testing transformer from zero to 180,000 volts in 100 steps and a one-panel switchboard on which is mounted a 100-ampere carbon circuit-breaker. The equipment also comprises one 200,000-volt electrostatic voltmeter, one 200,000-volt spark gap and three oil-testing cups.



STANDARD FLEXIBLE TOWER.



STANDARD BRACED TOWER.

The leads are passed through the floor through bushings of ample dielectric strength to the transformers immediately below. Each transformer is isolated in a separate fireproof compartment and each is of 2,700-kilovolt-amperes capacity 60,000 to 12,000 volts. Six of these transformers are now installed, but compartments have been provided for nine. These vacant compartments are at present being utilized for a substation, there being three 500-kilovolt-ampere transformers, 12,000 to 2,200 volts, installed therein. These are used for the distribution of light and power in this vicinity.

On the same floor, but isolated from the transformers, are two lines of cell structures containing the 12,000-volt circuit-breakers with disconnecting switches and busbars. The cell structure is built up of reinforced concrete with barriers separating the different phases. Ten feeder circuit-breakers of 200-amperes capacity each have been installed, of which six will be used at once. The feeders leave the building in the basement in lead-covered three-conductor cables on racks suspended from the ceiling. Each feeder before leaving the building is connected to a set of low-equivalent lightning arresters as a protection from line surges. For the protection of apparatus in the station, double sets of choke coils and relays have been provided. The line protection is similar to that in the generating station and consists of electrolytic arresters in the building and spark gaps with resistances mounted on the roof.

The cooling of the transformers is accomplished by the circulation of water as a cooling medium. For this a cooling tower of 200,000-gallons-per-day capacity is provided. The water is pumped to the top of the tower where it is divided into tiny particles and trickles over wooden troughs to a concrete water tank below. A large eight-foot fan in the bottom of the tower forces air from below up through the descending water and cools it as it falls. In winter the water is by-passed into the tank without passing through the tower. By these means it is expected a method is provided of cooling the water under all conditions of weather from the coolest day in winter to the hottest day in summer.

A complete system of apparatus for purifying transformer oil has been installed similar to that in use at the generating station.

The equipment for the system was furnished by the following: Turbines and governors, Jens Orten-Boving Company, London, Eng.; generators, Vickers Sons & Maxim, Ltd., Sheffield; transformers and switching equipment at generating and terminal stations, Canadian Westinghouse Company, Hamilton; general works at Point du Bois, John Gunn & Sons. The design and superintendence of the work from its inception up to November, 1908, was in the hands of C. B. Smith; at that time the work was taken over by the firm of Smith, Kerry & Chace, W. G. Chace being engineer in charge.

**Coal Production in the United States.**

The United States Geological Survey has issued its annual coal chart, showing the production of coal by states from the year 1814 to 1910. The figures relate a wonderful history of growth. In 1814 a total of 22 tons of coal was produced in Pennsylvania. In 1815 the percentage of increase was good but still only 50 tons were taken out. By 1825 over 100,000 tons were mined in the two states producing. In 1850 the figure had reached 7,018,181 tons. In 1876 it was 53,280,000 tons. At the end of the century it was 269,-684,027 tons. In 1905 it was 392,722,-635 tons. In 1907, which it was supposed would remain the record year for some time, the production was 480,363,424 tons, but in 1910 the enormous total was reached of 501,596,378 short tons, a production larger by far than that of any other country in the world. So steady has been the increase in American coal production that most of the years have been record breakers. The total production since 1814 has been about 8,250,000,000 tons.

## GOING VALUE OF PUBLIC UTILITIES.

FRANK F. FOWLE'S PAPER PRESENTED AT JOINT ELECTRICAL MEETING IN CHICAGO.

A joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, was held in the rooms of the latter in the Monadnock Block, Chicago, on the evening of November 22. J. G. Wray, chairman of the Chicago Section, A. I. E. E., presided. Ralph W. Pope, honorary secretary of the Institute, was present and made a few remarks on the value of cooperation by engineers of various professions.

The paper of the evening was presented by Frank F. Fowle, of Chicago. It was entitled "Going Value," and is briefly summarized below:

GOING VALUE.

Mr. Fowle opened his paper by calling attention to the need that engineers have had to meet in the last decade of combining both economics and engineering in the solution of public-utility problems. Going value is of importance both from the legal and economic standpoints. Unfortunately there is no universally accepted theory of what constitutes and measures going value. Taking up the economic definition of value, Mr. Fowle pointed out the two main theories relating to it; under the theory of free competition, the law of supply and demand regulates prices completely, while under the socialistic theory price is governed by cost plus a fair profit. Corresponding theories of rate regulation of public utilities are met with; these are known as the value-of-service theory and the cost-of-service theory. The former and older theory limited profits only by natural economic laws. The modern theory is the basis of practically all rate regulation; while it limits the profits of public-service business, it also makes it more stable and less hazardous as an investment. In several states competition in public utilities has been set aside in favor of regulated monopoly. One of the fundamental problems in such regulation is to find what is the legitimate investment in the public-utility property. The most generally accepted method is by an appraisal to find the cost of reproducing the property. The book value, if reliable and available, is an aid in showing what the property has cost. The outstanding capital stock and bonds may be a fair indication of the total value. It is well recognized that an established going business costs more than the mere physical plant and this has led to a classification of the total value into tangible investments, such as organization costs, plant equipment, construction allowances and working capital, and the intangible investments, including franchises, going value and good will. Taking up the intangible features, according to the modern theory franchises granted by the public have but a nominal value. Where a monopoly exists there is no such feature as good will.

Going value has generally come to mean that element of value which is created by an active or going business, in addition to the tangible investment for property and working capital. Mr. Fowle divides the various methods of determining going value into six different classes, as follows: (1) Capitalizing the net earnings. (2) Finding the cost of reproducing the net earnings. (3) Capitalizing the early losses. (4) Capitalizing the cost of securing business. (5) Overcapitalization of consolidated companies. (6) Miscellaneous methods.

The first method has but limited application to public utilities. It assumes the going value be that value in excess of the tangible investment which is created by capitalizing the whole net earnings, after meeting depreciation, at the rate of interest current for investments of like character, location and risk. But according to the modern theory of rates there can be no going value which is supported by net earnings in excess of a reasonable rate of return on the property.

In the second method, which has been extensively used for the valuation of water works, the going value is regarded as the potential business value determined by the net income which a plant in operation will have in excess of what a substitute plant of like character, the construction of which is begun at the time of valuation, can produce, the annual excess earnings being reduced to present worth. This determination requires a large amount of data not always available; the usual way is to plot curves of commercial revenue and operating expenses for several years and project them forward to the time when the new plant is assumed to have the same revenue. The author cited a number of cases illustrating this method, notably those of the Peoria water works and the recent Chicago gas-rate investigation by W. J. Hagenah, and discussed at length what he regards as its shortcomings, chiefly that it measures no element of value under the cost-of-service theory of rates.

According to the third method, which is the one approved by the Wisconsin Railroad Commission, the early losses usually incurred in developing a business are capitalized, with interest, as the going value. Great care is required in carrying out such a plan; the business which prospered least would apparently be given the greatest going value.

According to the fourth method, the cost of developing a business is regarded as a legitimate means of finding the going value. However, such costs are very commonly included in selling costs and are therefore part of the operating expenses.

In the fifth method, the over-capitalization of a property formed by merging two or more competing properties that is in excess of the cost of the tangible property that is needed by the consolidated company is regarded as a fair measure of going value. On the theory that the public is responsible for duplication of equipment where it has authorized needless competitors, it must asknowledge such over-capitalization.

The sixth class covers a number of miscellaneous arbitrary methods not worthy of consideration on the cost-of-service theory of rates.

The author's conclusions are:

1. Under the cost-of-service theory we seem bound to recognize every element of actual cost, for both tangible and intangible property, which is legitimate, reasonable and necessary.

2. Going value, under this theory, cannot be supported by capitalized net earnings in excess of a fair return on the cost value of the property.

3. Rigid rules for measuring the going value, if any, under the cost-of-service theory, cannot safely be laid down, because local circumstances in each case are different and each issue should be treated on its merits.

4. The general test for value of any kind, under this theory, is always the cost, but this may be tempered by the great desirability of distributing justice and equity to both the public and the utility companies in equal measure.

The discussion was opened by Benzette Williams, past president of the Western Society of Engineers. He said the determination of going value by capitalizing the net earnings has no standing in the rulings of the courts or public-service commissions, although the companies have usually contended for it. There are only two legitimate methods of determining the value of a property. The first is to find the cost of construction plus the cost of developing the property; under this there can be no going value. The second is to base it on an appraisal of the physical property; this might be called the "junk" theory. A plant is worth more than its physical value or cost of construction because it has an established business. This is shown by the higher value of such a property over that of a new property under similar local conditions. The going value is the excess of revenue which a plant is earning beyond what a new plant would bring. The courts have consistently held to this view. The Wisconsin commission has apparently changed its views and its rulings are difficult to apply. There is no such thing as intangible value in a property; even though not all physical, it is all tangible and determinable. Franchises and good will have no value in most modern utilities. On the whole, "going value" is an unfortunate term and should better be changed to business value, revenue value or service value and the total value of a property should be called the "going value."

J. W. Alvord, also past president of the Western Society of Engineers, said he was pleased to note that the author of the paper had so successfully based it on broad economic principles. He concurred in most of Mr. Williams' statements, but dissented from what seemed to be Mr. Fowle's inference that the stand on going value taken by the Wisconsin commission was thoroughly sound. There are various ways of finding the value of a property; if any one is adopted its theory must be adhered to throughout. This is not true in the recent Wisconsin rulings. The courts, on the contrary, have almost invariably favored determining the value by finding the cost to reproduce the business. This is the proper basis of determining the going value, as is shown by the fre-

quency of its use in water-works and other utility cases. One reason for so much confusion on the subject of going value is the lack of a simple definition. Mr. Alvord would define it as the value of a created income.

W. D. Martin stated that the Des Moines gas case, which is soon to be decided, is of particular interest just now because several methods of determining going value were presented in it.

M. G. Lloyd said that "going value" was an unfortunate term, as is evident from the variety of senses in which it is used. It should represent that value that is required to make the business a going one.

J. R. Cravath called attention to the self-evident fact that from the "square-deal" standpoint the investor has a right to get a fair return on the legitimate investment in the property and this must be taken into account in any determination of going value that may be made.

On account of the lateness of the hour Mr. Fowle briefly closed the discussion. He agreed that "going value" would have been a better term if it meant the total value. He also agreed with most of the remarks of Messrs. Williams and Alvord, but did not coincide with their views on the reproduction-of-earnings method.

### American Institute Meeting, to be Followed by a Smoker.

The two hundred and sixty-sixth meeting of the American Institute of Electrical Engineers will be held in the Engineering Societies Building, New York City, on December 8. A paper on "Methods of Varying Speeds of Alternating-Current Motors" will be read by Gus A. Maier, of the General Electric Company.

The Meetings and Papers Committee has felt that there is a demand on the part of a large number of members who come to Institute meetings for an opportunity to meet each other and to discuss matters of interest.

To promote sociability the committee has arranged to start promptly the reading of the paper at 8:15 p. m. and to adjourn at 10 o'clock, at which time the tenth floor will be thrown open and the members will go from the auditorium to meet each other in the Institute rooms. Light refreshments will be served, and if the innovation is a success it will be continued and made a feature of all meetings.

### Convention of Mechanical Engineers in New York City.

The American Society of Mechanical Engineers will meet in New York City next week to perfect plans for the most progressive movement ever undertaken by any engineering organization. More than forty committees are being appointed, each one of which is to investigate some particular industry and thus permit the Society to serve it for the betterment of industrial and social conditions therein.

Aside from the betterment to the industrial world from the introduction of standardized and more economical methods, it is expected that this movement will aid greatly in bringing the engineering profession into a share of that prominence and leadership in public affairs now largely held by lawyers and financiers. It is believed that the time has come for engineers to make their influence felt in regard to public questions, and that no profession is better fitted than that of engineering to cope with the problems of municipal, state and national affairs.

Four committees are actively at work in their special lines, namely, on textiles, on cement, on machine shops, and on administration of industrial establishments. As a result of their investigations, papers will be presented and special sessions held during this convention by members representing these industries.

Membership on these committees will not be confined to members of the Society. On the contrary, each committee will include men who are recognized as possessing special knowledge and experience in the particular industry under investigation without regard to society membership.

These committees are expected to investigate the peculiar problems and needs of the technical branch under their charge, and render reports or suggest means whereby unsolved problems may be brought before the Society as a whole, or new developments brought to its attention.

Following is the program for the meeting:

PROGRAM.

Tuesday, December 5, 8:30 p. m. President's Address and Reception.

Wednesday, Business Meeting, 10:00 a. m.

Professional Session.

"The Turret Equatorial Telescope," James Hartness.

"Expense Burden: Its Incidence and Distribution," Sterling H. Bunnell.

"Standard Cross-Sections," H. de B. Parsons.

Professional Session, 2 p. m.

"Tests of Large Boilers at the Detroit Edison Company," D. S. Jacobus.

"Strain Measurements of Some Steam Boilers Under Hydrostatic Pressures," James E. Howard.

"Herringbone Gears," P. C. Day.

Cement Session, 2 p. m.

Reception, 4:00 to 6:00 p. m.

Address, 8:00 p. m., "Geo-Dynamics, or the Mechanics of the Formation of Worlds," by Robert S. Woodward.

Thursday, Professional Session, 10:00 a. m.

"The Core Room: Its Equipment and Management," Henry M. Lane.

"Tests of a Sand-Blasting Machine," Wm. T. Magruder.

"Die Castings," Amasa Trowbridge.

"Variable-Speed Power Transmission," G. H. Barrus and C. M. Manly.

Gas-Power Section, 10:00 a. m.

"Oil Engines," H. R. Setz.

"Test of an Eighty-five-Horsepower Oil Engine," Forrest M. Trowl.

"Design Constants for Small Gasoline Engines," Wm. D. Ennis.

"Natural-Gas Engine of 1,000 Kilowatts: Tests, Construction and Working Costs," E. D. Dreyfus and V. J. Hulquist.

Excursion, 1:30 p. m., to inspect the Steamship *Olympic*, the largest passenger vessel afloat.

Friday, Professional Session, 10:00 a. m.

"The Development of the Textile Industries of the United States," Frank W. Reynolds.

"Rational Psychrometric Formulæ: Their Relation to the Problems of Meteorology and of Air Conditioning," W. H. Carrier.

"Air Conditioning Apparatus," W. H. Carrier and F. L. Busey.

"Some Experiences with the Pitot Tube on High and Low Air Velocities," Frank H. Kneeland.

### To Sell No More Perpetual Leases.

The province of Quebec will sell no more of its waterpowers in perpetuity, and has advertised for proposals for ninety-nine-year leases of ten large waterpowers in the province. In future the policy of leasing will be followed, so that the province will reap the benefit of the development which takes place.

### A French Electric Villa.

A house has been built at Troyes, France, in which the electric current is put to every possible use in enhancing the convenience and luxury of the home. The house is owned by Georgia Knap, and is known as La Villa Feria Electra. Much of the work which is ordinarily done by servants is in this house performed by electric conveniences.

A visitor to the villa finds that when he rings the gate opens by itself, while a voice proceeding from a hidden telephone, tells him to enter and allow the gate to close. The mechanism for opening and closing the gate is shown in the accompanying illustration. There is also a telephone at the front gate which permits the occupant to converse with the visitor. At the door the visitor is confronted by a mat which cleans and polishes his shoes. If the visitor arrives after nightfall the same push button that rings the bell will light up the path from the gate to the house.

The house is a real museum of electrical inventions and conveniences, the dining table being perhaps the greatest wonder. No servants wait upon the diners. Beside each plate is a small glass and metal cylinder which becomes an electric radiator at the touch of a button. Foot warmers are located under the table opposite each chair. At the head of the table is a circular desk, its center traversed by a metal strip with a groove like a miniature railway. At the touch of a button this desk disappears through the floor, and in its place a steaming tureen of soup arises ready for serving. The tureen passes automatically around the groove in the table from guest to guest until each one has served himself. Completing the journey it disappears again through the floor. In a few minutes a receptacle for dirty dishes appears and awaits its load. In a similar manner all the food from the first to the last course is served. In hot weather there is a fan to blow cool air across the room, the air being both scented and cooled by passing over perfumed water. Of course, the room is electrically lighted.

In the kitchen not only is all the cooking done by electricity, but all the various utensils used in preparing the food are electrically driven. The dishes are of aluminum. Among the machines to be seen here are a mincing machine, coffee grinder, dish washer, and a buffer and polisher. The motor-driven apparatus for conveying the dishes to the dining room is also located here.

In the laundry the washing, drying and ironing are done by electricity. All rooms in the house are heated, lighted and ventilated by the use of electric current. Telephones and electric cigar lighters are to be found everywhere. By a series of mirrors the occupant of the house can see who is standing at the gate in the street. By means of the telephone he can converse with the visitor and by pressing a button the gates are electrically made to swing open or close.

In the bedroom it is only necessary to press a button in order to have a hot-water bottle heated. In the morning the window shade can be raised or shutters opened in the same simple way, and breakfast, the morning newspaper and the mail are automatically delivered to the room. An electric burglar alarm is operated should anyone attempt to break into the house during the night.

ELECTRICALLY OPERATED GATE.

DINING TABLE WITH TRAVELING TRAY.

### Water-Power Withdrawals.

Over a million and a half acres of public land now stand withdrawn by the Government as being valuable for the possible development of water power. During October the United States Geological Survey recommended the withdrawal of 54,422 acres as having power possibilities and the restoring of 2,600 acres in Montana and Wyoming because field examination by the Survey showed them not to be valuable for that purpose.

### Census Report on Poles.

A preliminary statement issued by the Census Department shows the number of poles purchased by telephone and telegraph railroad and power companies in 1910 and the three years preceding. According to this report there were 3,870,694 poles purchased in 1910. Of these 73.2 per cent were used by telephone and telegraph companies; 18.9 per cent

by electric-railroad light and power companies and 7.9 per cent by steam railroad companies.

### Electric Drive for the Earth.

While it has never been demonstrated that interstellar space offers any resistance to the motion of ponderable bodies and it is consequently doubtful whether any motive power is necessary to keep celestial bodies in motion, nevertheless theories have occasionally been advanced to account for the motion or rotation of such bodies. At least there must have been some force in play at the time when such motions were first started up.

The accompanying illustration of a model prepared by Peter W. Sothman illustrates one theory which might account for the rotation of the earth.

MODEL OF EARTH ROTATED BY THERMO-ELECTRIC CURRENTS.

The model consists of a globe made up of two metals in which thermo-electric currents are caused to circulate when one side of the globe is heated. The heating effect is produced by the presence of a lamp whose radiation takes the place of sunlight. A magnetic field is necessary to produce motion on this hypothesis and it is supplied in the model by a U-shaped magnet. The magnetic field thus produced is approximately horizontal while the motion takes place around the vertical axis. The permanent magnet and the thermo-electric currents provide the two necessary requisites of an electric motor. The model makes about four revolutions per minute.

## LETTERS TO THE EDITOR.

### Petersburg Franchise.

*To The Editor:*

In reference to an article in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, on page 1058 in reference to Petersburg, Ind., will state that there has been an error made. While Petersburg is anticipating letting a new franchise early in the year of 1912, will state that in no way is the Evansville Gas & Electric Light Company connected with this proposition mentioned by you.

I, as general contract agent of the Electric Department, have been employed by them as an individual to take care of their interest in the letting of this new franchise.

S. R. GALLAGHER.

Evansville, Ind., November 21, 1911.

### Electrocuting Insects.

*To The Editor:*

The following has a bearing upon the article in your issue of September 9 on the destruction of insects. A good many years ago the first long-distance transmission electric line was installed between Folsom and Sacramento, Cal.

When it was found to be a success, the company had an excess of power, especially in winter. To dispose of this excess they induced the city of Sacramento to install a most elaborate street-lighting system; in fact, it was thought at the time over-elaborate, and it was even insinuated that there was graft. However, the system was expanded until Sacramento was the best lighted city in the country, and is today, for that matter.

Sacramento used to be badly mosquito-ridden and bitten. It is surrounded on three sides by swamps. When the lights were on the first summer, they attracted a swarm of mosquitoes, gnats and beetles that made life almost unbearable, so much so that the beetles were promptly dubbed "electric-light bugs."

I noticed that the beetles would fly to the light and then drop stunned, and then I noticed that when they lighted on the wire that they would drop. From this I reasoned that they were affected by the static charge of the conductor and lamps.

This phenomenon so impressed me that I remembered it through all these years and, when in California last summer, made a special trip to Sacramento to observe it anew. Though I was there for a week I did not see a single beetle and there used to be, without exaggeration, millions of them. I found even that the people had forgotten about them. Further the mosquito and gnat nuisance was abated.

I believe that it was the excessive use of electricity, along with the numerous high-tension lines, with their corresponding static charge, used out there, that has caused this and I feel that it is worthy of serious investigation.

Certainly it does seem reasonable that if we could dispose of the female before she gave forth her brood, we could gradually eliminate the pests.

J. F. DURYEA.

New York, N. Y., November 25, 1911.

### Census Report on Milwaukee's Electrical Manufacturing Industry.

In another part of this issue is given an interesting statement of the gross data ascertained by the Thirteenth United States Census respecting the manufacture of electrical machinery, apparatus and supplies in this country during the year 1909, this being compared with the corresponding figures for 1904. These data have also been classified for the principal centers of manufacture and the following summary shows the statistics for Milwaukee, Wis.

The value of products represents their selling value or price at the plants as actually turned out by the factories during the census year, and does not necessarily have any relation to the amount of sales for that year. The values under this head also include the amount received for work done on materials furnished by others. The actual details can be drawn from the tabular summary which follows:

CENSUS DATA ON MILWAUKEE'S ELECTRICAL MANUFACTURE.

| | Census 1909 | Census 1904 | Per cent of increase 1904-1909 |
|---|---|---|---|
| Number of establishments | 18 | 12 | 50 |
| Capital | $3,656,000 | $5,133,000 | *29 |
| Salaried employees | 340 | 223 | 52 |
| Salaries | $372,000 | $310,000 | 20 |
| Wage earners (average number) | 998 | 815 | 22 |
| Wages | $598,000 | $491,000 | 22 |
| Miscellaneous expenses | 352,000 | 543,000 | *35 |
| Cost of materials used | 928,000 | 655,000 | 42 |
| Value of products | 2,749,000 | 2,257,000 | 22 |

*Decrease.

### Coal Production in Illinois.

Illinois has produced more coal than any other State except Pennsylvania, the total tonnage since 1833, when coal mining first began in the State, being 790,333,235 short tons, according to the United States Geological Survey

# Central-Station Practice

## SWITCHBOARDS OF THE PEDESTAL, POST AND CONTROL-DESK DESIGN.—III.

BY STEPHEN Q. HAYES.

Most of the previous illustrations of control desks were made from photographs of the actual desks as erected, but some of the most interesting features, such as the arrangement of the miniature bus with reference to the circuit-breaker controllers and indicating lamps, show up more clearly in the photographic reproductions of drawings of such desks which follow.

Fig. 22 shows the front elevation, plan and sectional drawings of a control desk for a French turbo-generator station. This desk is of the same general type as that shown in Fig. 21, except that is straight not curved. This desk was provided with vertical edgewise instruments and equipped with a miniature busbar system arranged on the ring and group scheme, the red lamps, which indicate the closed position of the breaker, being drawn as solid black circles, and clearly showing up the method of connections. Each of the eight sections of this control desk takes care of one 8,000-kilowatt generator and five feeder circuits, the total length of the desk being only 24 feet, the height 8 feet 7.5 inches and the depth 3 feet 6 inches. The general type of framework for this desk is clearly shown. The leads from the control to the instrument frame pass up through the hollow cast-iron columns supporting the instrument frame. Suitable calibrating jacks are located in front of the desk for calibrating the various switchboard instruments without removing them from the frame.

As a sample of a control desk with instruments set in the face of the desk,

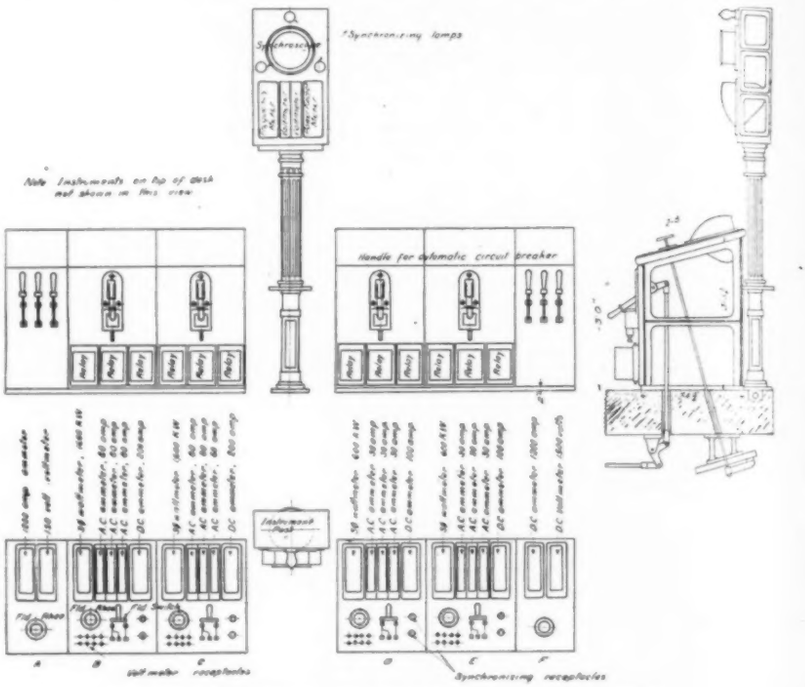


FIG. 23.—ELEVATIONS AND PLAN OF A CONTROL DESK.

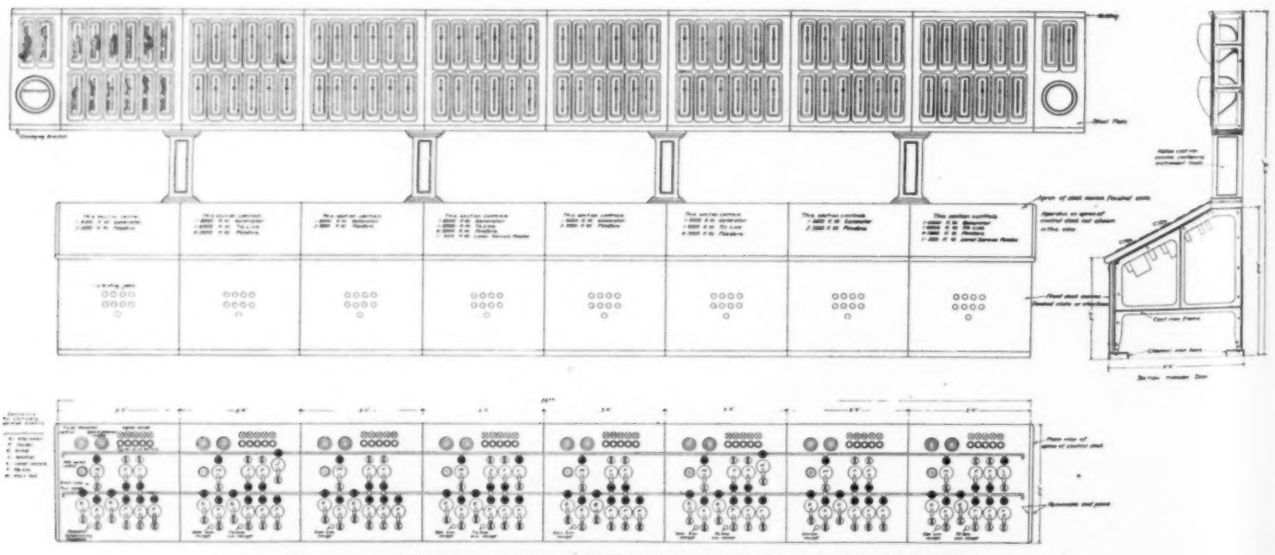


FIG. 22.—ELEVATION, CROSS SECTION AND PLAN OF A CONTROL DESK.

Fig. 23 shows the plan, elevation and sectional drawings of a desk for a water-power plant in Mexico. The two sections at the extreme ends are the exciter sections and are provided with three knife switches, a vertical edgewise ammeter and voltmeter, and exciter-rheostat handwheel in the face of the desk. The four remaining sections are used for the control of alternating-current generators, and each is provided with three vertical edgewise ammeters, a vertical edgewise direct-current field ammeter, a vertical edgewise polyphase indicating wattmeter in the face of the desk. These generator sections also contain the handles for distant-mechanical-control oil circuit-breakers, the handwheels for mechanically operated rheostats, as well as the necessary equipment of field switches, voltmeter receptacles, synchronizing devices, etc. A vertical post equipped with synchroscope, frequency meter, power-factor meters and voltmeters is placed at the center of the installation.

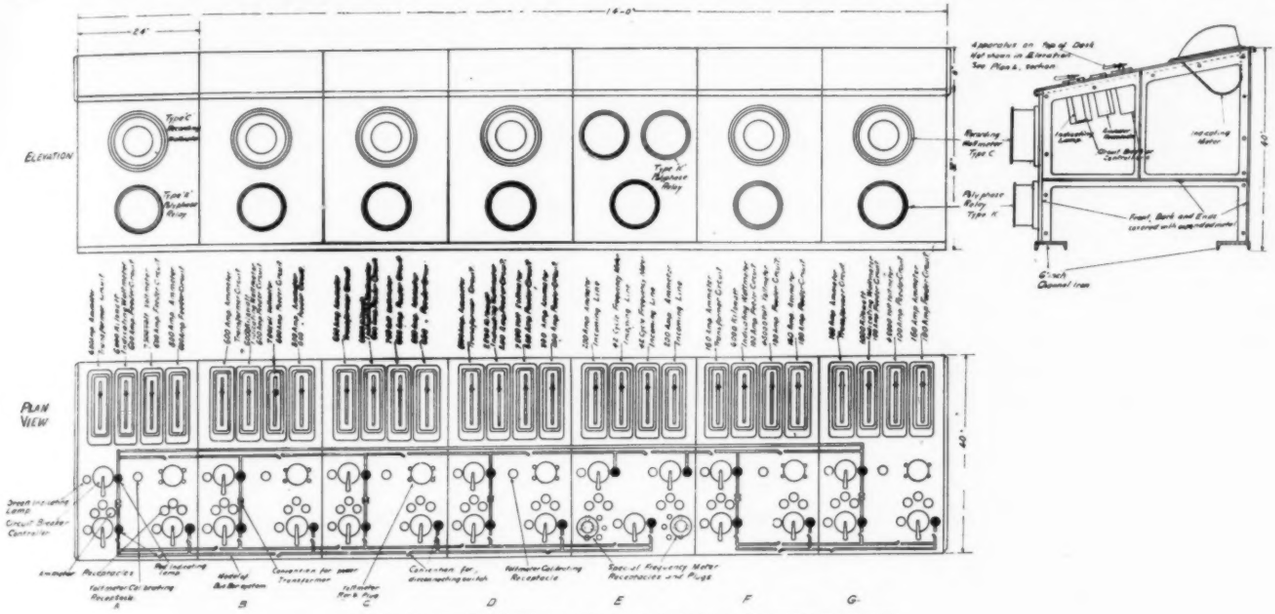



FIG. 24.—ELEVATIONS AND PLAN OF A CONTROL DESK.

Fig. 24 shows a control desk for an Italian receiving station, designed to correspond with European ideas of having the switchboard instruments placed in the face of the desk, and having the connections arranged in the form of a ring bus. This control desk was designed to take care of two 15,000-kilowatt, 72,000-volt, three-phase incoming lines controlled from section "E," and as may be noted these two lines were connected through breakers to a high-tension ring bus. The four sections to the left of section "E" were each used for the control of a bank of three 1,600-kilowatt transformers stepping down to 5,300 volts, and one 5,300-volt outgoing feeder. As may be noted, each bank of transformers was provided with a circuit-breaker for the high-tension circuit and one for the low-tension circuit connecting to one side of a ring bus, the other side of the ring bus being used for supplying current to the feeder circuits at 5,300 volts. Following the usual practice the ring buses are sectionalized by means of knife switches between each point where current is put in or taken out.

The two sections to the right of section "E" each controlled a bank of three 1,600-kilowatt step-down transformers, 72,000/27,000 volts, and two 27,000-volt outgoing feeder circuits. Edgewise indicating instruments were set in the top of the control desk, and round-pattern watthour meters were mounted on the front of the desk. The front, back and end of the desk were

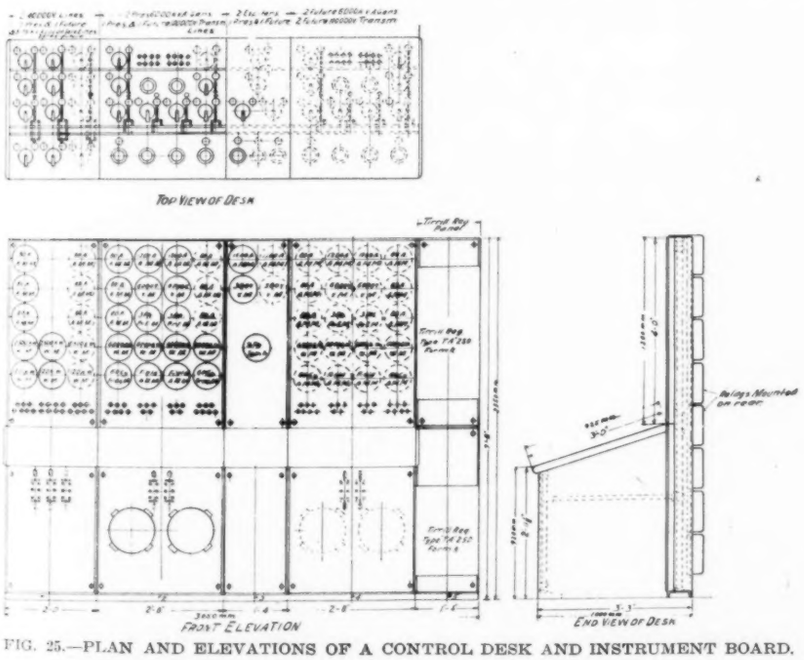



FIG. 25.—PLAN AND ELEVATIONS OF A CONTROL DESK AND INSTRUMENT BOARD.

made of expanded-metal construction, while the top was made of steel plate.

Fig. 25 shows the plan view, front elevation, and end view of control desk having instrument panels coming down to the top of the horizontal section of the desk, these panels for this particular desk being provided with round-pattern meters seven inches in diameter. This desk when fully equipped will take care of two 300-kilowatt, 250-volt, waterwheel-driven exciters; four 6,000-kilowatt, 4,000-volt, three-phase generators; four banks each of three 1,750-kilowatt, single-phase transformers stepping up to 100,000 volts; three 1,750-kilowatt, three-phase transformers stepping up to 40,000 volts; four 100,000-volt transmission lines and two 40,000-volt transmission lines. The total length of the desk is only ten feet, and the depth three feet three inches.

The miniature bus on the face of the desk shows the various connections made by the breakers. This desk with its instrument frame is arranged to be mounted on pipe construction. In this plant, as well as in the plants where several of the other desks were provided, the exciter circuits and field circuits of the generators were controlled by electrically operated switches, as also were the main circuits of the generators, transformers and lines.

Owing to the necessary space limitations of an article of this kind, it has been impossible to dwell on many of the interesting features in the different plants for which these control desks, pedestals, etc., were designed, but it is hoped that this article will give at least some idea of the general trend of this class of switchboard design.

### The Pacific Gas & Electric Company's Extensive Service.

One of the most wonderful public-service corporations in the world is the Pacific Gas & Electric Company, which has its headquarters in San Francisco, Cal. Although its densest service is concentrated around the Golden Gate, its extended network serves a total area of 32,431 square miles, comprised in 26 out of the 56 counties in the state of California. Two-thirds of the entire population of the state reside in this extensive territory. The company supplies electricity to 158 cities and towns, with a population of 1,089,790; there are eleven hydroelectric plants in the mountains and three steam-driven electric plants in the large cities connected to the system. Gas is supplied from eighteen gas works to 33 communities having a total population of 988,900. Water is supplied to 17 towns, with a population of 43,415. Electric street-car service in Sacramento, whose population is 52,000, is also supplied by the company. The total number of employes is 3,500.

## Commercial Practice—Management, Rates, New Business.

### The Electric Solicitor.

In the October *Bulletin* of the New York Companies' Section of the National Electric Light Association, Joseph V. Guilfoyle, of the Yonkers Electric Light & Power Company, contributes an interesting treatise on this subject. He writes that this treatise was prompted by the fact that many of those actively engaged in the capacity named, or with intentions to become such, failed to appreciate the essential qualities which make up a successful solicitor. In very few instances has the writer found a man who generalizes on the sale of electricity in its varied fields, to be successful or proficient, whereas the man specially trained on one subject, becomes a specialist and can be entrusted with special affairs.

This classification as a specialist must not be misconstrued. A good solicitor, to be efficient, must have a general training in the electrical central-station industry. A solicitor should be a forceful and intelligent talker, willing to listen to the arguments that his prospects offer, and counterbalance or better their argument with one in favor of his company. A great mistake is made by many solicitors in regard to their using too many technical and electrical terms in conversation with prospects. This is confusing to the general public, as an argument in dollars and cents appeals more to the average man. The use of such names as volts, amperes, cycles, phases, kilowatts, etc., in a conversation mystifies many a man, and he may decide against electricity, fearing it too mysterious to be used.

A very good argument is to have some ideal installation to refer to. If the prospect runs a butcher shop, try to locate a good up-to-date example of electricity as applied to that business, where the current is used for lighting, refrigerating, meat choppers, etc., and use the advantages of that installation and the cost of operation, as your argument. Many merchants will confer on these subjects, and this will help your case considerably. This same point of having ideal cases in the vicinity or town for prospects to see and confirm, refers to every branch of the central-station industry. A great amount of help can be derived from the tables of average consumption, costs, etc., as furnished in the N. E. L. A. solicitor's handbook.

Above all, do not give a prospect any information, data, etc., on a subject that you are not familiar with, as it often is misleading, and if your advice is taken, the results are contrary. This is a bad blow to your company. If confronted with a subject on which you are not entirely familiar, equip yourself with the correct data for a later call, or have some other solicitor familiar with the subject call with you. Do not let your arguments in favor of electricity be on what electricity has done in the past, but what it is doing now, and will do in the future. Study the policy of your company thoroughly, and see that it is carried out to the letter. A thorough knowledge of your position, coupled with perseverance and courtesy, will make a successful solicitor, and assist in furthering the electric central-station industry.

You do not necessarily have to run down and criticise your rivals, such as gas, oil and steam, but rather make your efforts show the practicability and advisability of substituting electricity for light, heat and power.

Inasmuch as at present the hopes of the future in regard to power are directed toward electricity it is gratifying to see the attempt to justify the trust thus placed upon these interests in a repeated lowering of the cost to the customer in a period made notable by excessive increases in the cost of living. With lowered cost the field accordingly widens as the elements of saving to a community increase and the greater is the ease with which it meets the competition of older agents.

These elements of saving may, for convenience, be classified into the three divisions, light, power and heat.

Lighting development has progressed along both indoor and outdoor lines. Thanks to the illuminating engineer both these fields are being placed upon a scientific basis while meeting more and more effectually the demands of artistic taste. The superiority and efficiency of the tungsten lamp have been influential factors in winning for it a near monopoly in commercial, industrial and residential lighting. Its promise as a business getter has been confirmed. One particular field has been among small merchants who realize the value of a modern electric installation but were prevented by the expense from securing its advantages. It encroaches somewhat upon the field of the arc lamp in its growing use for ornamental street lighting. In business districts a demand has arisen for a system that will be attractive by day as well as by night, as its value as an advertising medium is thus greatly increased. In its use for series street lighting a very useful field is being exploited and one whose influence may be far reaching.

The flaming arc is preeminently an outdoor unit. By its immense candlepower the lighting of streets and outdoor spaces has been permitted to a degree hitherto impossible. Popular approval for abundance of light is by no means monopolized by this huge light source. Electric signs have demonstrated their popularity as most central stations are glad to testify.

Improvements in motors and controlling devices which tend towards simplification are great helps in extending the service. In addition to securing increased results along existing lines the new fields of refrigeration and the electric vehicle are rapidly opening a gratifying source for expansion.

Experience has shown that the public is willing to buy electric devices. Various heating appliances come under this heading which in addition to their own consumption are useful as auxiliaries to other electric installations.

## Motor Load in Yonkers Shows Remarkable Increase.

The united efforts of the contract and inspection department of the Yonkers (N. Y.) Electric Light & Power Company have resulted in increasing the motor installation in Yonkers nearly 200 horsepower in the last two months. A steady increase in contracts secured and installations signed has been noted and bids fair to make this a banner year.

## A Unique Rochester Organization.

"We don't want your business and we don't want your money unless our service is absolutely the best thing for you," is a fitting introduction for a much-commented-upon booklet which the Rochester Railway & Light Company has recently distributed. This booklet bears the caption, "A Unique Rochester Organization," and is characteristic of the policy of the company. The following extracts are taken from the second edition of this publication which was found necessary:

"The management of our concern is Rochesterian through and through, and recognizes that this Company prospers with the prosperity of each individual citizen, and that it suffers its proportionate share of adversity with each individual in the city. This fact alone shows the commercial motive for not wanting to serve you unless our service is the best thing for you.

"The management is not living for today alone, it is trying to build for the future. We want your business for the next hundred years, and again the highest commercialism would dictate that we should not get it in the first place, unless we can make it to your interest to give us the business for the extent of our natural lifetime.

"But that isn't all. We are human beings, and know that life won't be happy for us if we do not carry with us the consciousness that everything that we have gained has been gained on the highest standard of integrity. Each individual of us has to live with himself, and therefore wants to feel that he has been of some service to his fellow men and to his city in contributing something that is worth while as the product of his life work. We have to have our own self-respect in order to be able to live with ourselves, therefore we can't ask you to give us your business unless we are conscientiously convinced that you as well as we benefit by the transaction.

"To secure this end the management of our Company has surrounded itself with a group of men first and foremost of high ideals and ethical standards, men who could not be hired at any price to sell a commodity in which they did not personally believe, and whom no consideration would induce to make misrepresentation of that commodity. These men have been carefully chosen on the basis of technical skill as well, so that they might study your requirements and adapt our service so that it might be in the highest degree useful to you. The Company cannot afford to make mistakes in such matters, and, therefore, must employ men of the highest skill attainable.

THE COMMERCIAL DEPARTMENT.

"As the men in this department come into contact with you very often in your home, where the problems of utility and service must include a consideration of your personal desires and ideals, it is necessary that they be able to the fullest degree to enter into the spirit of your requirements—that they be in the broadest sense sympathetic of all the conditions with which you wish to surround yourself in your home, in the treatment of your display windows, and of your sales rooms. The men working in this department are not one-rule men. They know that what devices and equipment would be best for one place might not of necessity be desirable in another place, and so enter into your ideas as to select from our broad line of equipment just the device that best fits your individual conditions. They are glad to make the selection for you, or to supply you with detailed information about each device, with which you can judge for yourself as to its particular merits for your own individual use. They know the advantages of each different type of apparatus that we handle, whether in the gas or electric line.

THE ENGINEERING DEPARTMENT.

"When you sign a contract for electrical service you are not buying current alone. You are not particularly interested in purchasing electricity, excepting as a means of securing in your factory the best and largest production at the least price consistent with good service. We express this among ourselves by the oft repeated statement, "The customer does not buy current, he buys utility, satisfaction." We have, therefore, gone a considerable distance beyond the point of running the wires and sticking in a motor here and there. We have arranged to study your factory operations and the character of your machinery, and to so adapt our drive that it will help you to the maximum degree in the business for which you have organized. Our refrigerating engineers, for instance, are expert in every phase of refrigeration and ice-making. When they study your plant, they tell you not only whether you can afford to use electric power to run the plant, but whether you can make

changes and improvements in the refrigerating end of your equipment so as to use smaller and smaller quantities of power and to get better and better control of your temperatures. When our engineers electrified the largest dairy in town they went much beyond the belt which our motors drive, and found for the dairy the most effective form of pasteurizer on the market, so as to cut down to an almost negligible amount the steam needed for pasteurizing, and to improve to the highest degree the certainty of effective pasteurization. These illustrations perhaps indicate the extent to which we consider your problem.

"In this work no thumb rules are used, but each installation is studied on its own individual requirements and the best scientific and practical knowledge in the various arts is brought to bear."

### Electric Power for Pumping City Water.

At a recent meeting of the Central States Water Works Association, at Cleveland, O., a discussion arose on the question of the use of electric drive for pumping water in connection with the city water supply. The question was largely in regard to the comparison of cost between steam pumping stations and those operated by electric power purchased from central stations.

Joseph McKinley, in the course of the discussion, called attention to the fact that this business had very desirable features for the central station, since the hours of use are long, the time of maximum demand is favorable, and the ratio of average demand to maximum demand is high, thus insuring a high load-factor. Under these conditions it should be possible to obtain a rate from the central station that will make electric pumping much cheaper than the use of steam. In the City of Pittsburgh there are several district pumping stations, one of which is electrically driven, the other steam-driven. The former is operating more cheaply than the latter. Current is supplied by a municipal power plant at a charge of three cents per kilowatt-hour.

W. B. Wilkinson told of several instances where electric equipment had been installed, current being supplied from the central station. This was done after a trial of several months and a permanent contract would not have been made had the trials not proved satisfactory. In one installation handling 300,000,000 gallons, where it was planned to put in additional units, the cost would be $15,000. The estimate for electrical equipment amounted to only about one-half as much.

A. W. Inman called attention to the lower first cost of installation with electric drive than with steam apparatus. He told of one case where centrifugal two-stage pumps, operating against 110 pounds pressure, handled 800,000 gallons each day. The cost was about two cents per thousand gallons. He thought the rate charged in Pittsburgh—three cents per kilowatt-hour—was too much, considering the facilities for obtaining coal at that point. His company, distant eighty miles from Pittsburgh, was selling power for 2.5 cents per kilowatt-hour.

C. L. Crippin told of a plant which is pumping 300,000 gallons a day in summer and about 150,000 gallons per day in winter. The cost is about 3.25 cents per thousand gallons with the present steam equipment. The town thought that it could do better and has obtained a report from a consulting engineer and has obtained a proposal from the central-station company. It is estimated that the cost, using electric drive and a compressed-air system for lifting the water from the wells to the settling basin, and centrifugal pumps for pumping from the basin into the mains, would be about 2.5 cents per thousand gallons. The price of coal in this town is about $2.00 per ton unloaded. The operating conditions at present are favorable, but one man being required to attend to the firing and pumps. Nevertheless, it is expected to save by using electric power.

The same speaker told of a case where gas engines had been used as prime movers. The supply of water in summer is 100,000 gallons per day and in the winter about 50,000 gallons. Two gas engines have been used, one driving an air compressor and one driving a triplex, double-acting pump. The lifts are small. The cost of gas is thirty cents per thousand cubic feet, which brings the cost of pumping to five or six cents per thousand gallons. The triplex pump has been changed to motor drive on account of trouble with the gas engine and it is intended to use an electric motor with the compressor. It is expected in this way to reduce the cost of pumping to three or four cents per thousand gallons, but the principal object in changing to electric drive is not so much economy as reliability.

T. W. McNamee told of a belt-driven pumping installation which handled 100,000,000 gallons per day, with a power consumption of 700 kilowatts. The cost of coal per kilowatt-hour is five mills, which amounts to 3.5 mills per thousand gallons of water. If a rate of 2.5 cents could be secured for electric power, the cost would be only 1.75 cents per thousand gallons of water. In this case the water is pumped against a pressure of ninety pounds per square inch.

### New Orleans Company Issues Weekly Folder.

The New Orleans Railway & Light Company started on November 12, the regular weekly publication of a small folder which is being distributed in that city to the extent of 15,000 copies weekly.

No name has yet been chosen for this publication, but the most suitable suggestion which may be made will be rewarded with a prize consisting of an electric coffee percolator, an electric toaster, an improved disk stove, and an electric iron. The folders are distributed by being placed in boxes on the street cars. They contain a list of the current amusements in the various theaters, various matters of local interest, a few humorous items, and some statement regarding the use of gas or electrical equipment in the home, which has a distinctive advertising value and is expected to bring new business. The leaflet is illustrated each week with some domestic electric appliance.

### California Company Reduces Lighting Rates.

The Oakland Gas, Light & Heat Company, of Oakland, Cal., has reduced its rates in both Oakland and Berkeley, the change going into effect on December 1.

The Oakland rate for lighting will now be seven cents a kilowatt-hour, with sliding scale, graded according to consumption, to three cents per kilowatt-hour. The former rate was nine cents per kilowatt-hour, graded to 3.5 cents. In Berkeley, rates for electric lighting will be seven cents per kilowatt-hour, graded as above. The former rate was 8.5 cents.

# Industrial Power

## EUROPEAN METHODS IN SOLVING THE PROBLEMS OF ELECTRIC DRIVE.

BY C. A. TUPPER.

During his recent tour of European countries, the writer found in parts of Switzerland and Austro-Hungary and the spinning and weaving districts of the German Empire, from Chemnitz in the East to Elberfeld-Barmen and Muenchen-Gladbach in the West, examples of the application of electric power in the textile industries which are of particular significance, not so much in themselves as from the manner in which the various problems have been worked out. In the following description, from which many steps have necessarily been omitted in reducing a highly technical subject to a clear explanation, the principal feature to be noted by the reader who will look between the lines is the number of motions, and consequently multiplication of forces, which had to be investigated in arriving at the conclusions given. Each one of these motions and forces, which are peculiar to only one phase of a single industry, were the subject of careful theorizing, experiment and trial, of prolonged observations and close calculation. Among the foremost in this work have been the engineers of the Swiss firm of Brown, Boveri & Company, to whose courtesy the writer is indebted largely for the facts and illustrations presented herewith. Other branches of industry are being subjected in Europe to the same careful scrutiny, with the object of solving the different problems of electric drive by means of scientific analysis of the motions and forces essential to each process, together with their exact inter-relation. Approximately the same results will, in many instances, be arrived at in this country by the short cuts of cut-and-try methods, coupled with truly scientific work on the part of experts in the employ of a few large companies; but there is much to be gained by following the work being done abroad and securing for ourselves the benefit of European experience. The following, which has already been adopted to some extent in the United States, is offered as a pertinent example.

In the manufacture of cotton yarns and thread the old system of mule spinning, an intermittent process in which the yarn is first drawn and twisted and then wound into bobbin

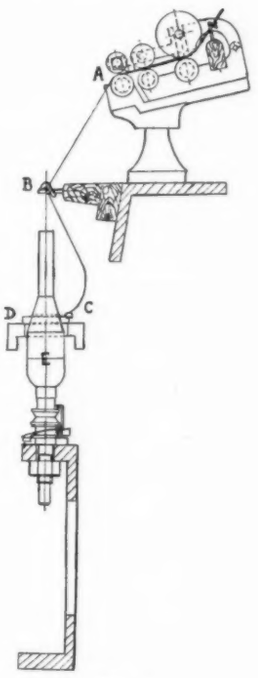



FIG. 1.

form, is gradually being displaced by the modern ring spinning, a continuous process in which drawing, twisting and winding take place simultaneously. Quite a number of advantages, some of which are very important, result from the use of this system, among which are economy of space, increased production and reduced attendance or lower cost of labor.

The introduction of ring spinning has, however, been attended by difficulties. At first it seemed that what are known in textile parlance as the "higher numbers" and "soft wefts" could only be spun on the mule, due to the uneven tension on the ring frame, as this tension of the yarn continually varied between two extremes, being greatest at the nose of the bobbin and least at its shoulder.

To understand what this means, it is necessary to consider the various steps in the spinning process. These are very simple. The roving bobbins are placed in a creel and the roving is guided, as shown in Fig. 1, to a set of rollers. Each successive pair of rollers runs at a higher peripheral speed and the roving is passed through, leaving the grip of front roller, *A*, sufficiently attenuated but with the fibers still lying loose and practically parallel. On the way to the wire eye, *B*, which is fixed in a hinged threadboard and arranged concentrically over the spindle, a twist is introduced by means of the circular motion of the little traveller, *C*, that fits loosely on the ring *D*. The finished yarn is pulled through the traveller on to the spindle *E*, upon which it is wound in the form of a firm bobbin. The yarn drags the traveller round the ring, not at a speed corresponding to that of the spindle, but with just sufficient slip to allow of the quantity of yarn given out by the rollers above being wound on the bobbin. The rings are carried on a rail or plate fixed to the upper end of pokers, which are guided by a double rail and, by means of suitable mechanism not shown in the drawing, are given a motion up and down; thus the yarn is wound tightly on the bobbin in conical layers with slightly crossed threads, enabling the subsequent unwinding to take place without entanglement. Among the requirements in successfully carrying through this process are constant stress, or breaking weight, on the yarn to obtain a good quality of product with a minimum of broken ends; practically constant pull on the yarn to secure firmly and evenly wound bobbins, and the fullest possible utilization of the mechanical working capacity of the ring frame.

When ring spinning was first intro-

duced it was the uniform practice to drive the spindles at uniform speed; but, in studying the electrical requirements in textile mills for this character of service, Brown Boveri & Company came to the following conclusions, after a long investigation of the various motions involved:

(1) When driving the spindles of a ring frame at a constant speed, the tension on the yarn between traveller and bobbin varies considerably, according to the diameter on which the winding is performed. This results in an uneven building up of the bobbin, the yarn on the smaller or inside diameter of the bobbin being wound relatively tight while on the larger or outside diameter it is too loose.

(2) Under these conditions the tension at the wire eye and between wire eye and front roller also varies according to the respective diameters of the bobbin. The tensions arising there are smaller than those between traveller and bobbin, but, the yarn having practically no twist, it is unevenly drawn, thereby affecting the quality. The yarn at this point is also exceedingly weak, as compared with the twisted yarn, and most of the breakages were found to occur here.

(3) The conditions above stated were observed at all positions of the ring rail. The unevenness of the tension, due to winding on large and small diameters respectively, is even greater in the upper than in the lower positions. It is interesting to note that, when winding on *equal* diameters, the tension decreases somewhat towards the upper position, the pull on the yarn being largest when forming the base.

(4) When winding on the larger diameter the "balloon," or effect exerted on the yarn by centrifugal force, is also larger; when winding on the smaller diameter it is smaller.

(5) When winding on the smaller diameter at the upper position of the ring rail the balloon practically disappears; hence the danger of broken ends above mentioned is considerably greater, and the quality of the yarn, as spun, is still more affected. Furthermore, small knots in the yarn passing the traveller give rise to momentary tensions which are multiples of those arising normally with even yarn; and, if there is a distinct balloon, these sudden abnormal tensions do not reach up to the front roller, *A*, but only cause a sudden contraction of the balloon, with the result already indicated, unless there is enough of a balloon or sufficient elasticity in the process to take up the sudden jerk.

(6) As the balloon disappears at the very moment when the tension on the yarn is greatest, the maximum constant speed permissible is determined by conditions which occur only periodically, *viz.*, during each rise and drop of the ring rail, and which therefore lasts but a fraction of the whole working time. For the greater part of the spinning period the number of revolutions might be materially increased beyond the speed limited by a uniform velocity. Hence, the output obtainable from a ring frame under the best theoretical conditions is far from being fully realized when it is driven at constant speed, unless the defects above enumerated can be otherwise overcome.

Brown, Boveri & Company, as a result of numerous experiments, came to the conclusion that the conditions found to exist could best be met by a variation in speed during the spinning process, the recognition of the relation between the speed of the spindles and the tensions on the yarn having suggested the idea of utilizing it to reduce those tensions which are excessive and bring those which are small up to a normal value. The centrifugal force of the yarn forming the balloon, the resistance of the air against the yarn, the centrifugal force of the traveller and in consequence the friction of the traveller on the ring, were all found to vary as the square of the speed, with corresponding effect on the tensions.

Now it is possible to regulate the speed to fulfill several different requirements: (*a*) to equalize the tensions when spinning on all diameters of the bobbin; (*b*) to adapt the speed to the variable shapes of the balloon; (*c*) to fulfill both requirements simultaneously.

This equalization of the tension may be effected either between the front roller, *A*, and the wire eye, *B*, or between the traveller, *C*, and the bobbin, according to whether more importance is attached to an evenly spun yarn with few breakages or to a thoroughly uniform winding of the bobbin.

In the design of a motor to meet these conditions, it was apparent that the machine must develop a torque which is gradually variable within certain limits, attaining such values that speed variation will be obtained not only smoothly but as quickly as the spinning process requires. Good efficiency under actual service conditions, simplicity of construction, ease of operation and reliability are also essential features.

These requirements appear to have been very advantageously fulfilled by the Brown-Boveri single-phase repulsion motor, with Deri connections, which has been largely installed in various textile districts of Europe, as well as in other countries.

With this motor the starting, speed regulation and stopping are effected by the shifting of the brushes on the commutator. The torque available when starting is a multiple of the normal full-load torque and can be varied from zero to its maximum value as gradually as there is need, without the least jerk on the yarn. The current taken when starting is about one-third of that required for full load and, according to the torque necessitated by the ring frame, increases gradually to 1.5 to 2 times the value of the normal current. It is claimed that, with varying working speed, the efficiency remains almost constant. In starting up and when increasing the torque, the field of the motor is strengthened as the current increases; consequently the machine can always exert a powerful torque for acceleration with a minimum consumption of current. The adjustment of the brushes for any range of speed variation during the spinning period is automatically effected by a special gear, which, after once being set, requires no attendance and is not disturbed by the stopping or starting of the motor, but performs its service whenever the latter is running. This automatic gear is governed directly by the movement of the ring frame and moves the brushes at just the right moment to secure the necessary change in speed. Different designs are adapted to different types of ring frame.

Fig. 2 is a partial view of forty of these motors, each of seven horsepower, at 850 revolutions per minute, single-phase, fifty cycles, 500 volts, driving an equal number of ring-spinning machines in the Catende Mill, Villa Nathan, at Morenos, near Pernambuco, Brazil. The working variation in speed of these motors ranges between

700 and 1,000 revolutions per minute. Power is supplied from a three-phase alternating-current generating plant, the single-phase repulsion motors being evenly distributed between the phases. Other motors required in the mill which run at constant speed, including a separate installation for a large paper-making plant operated in connection with the textile mill, are of the standard squirrel-cage induction type. The single-phase motors are each provided with a very simple and reliable stator winding which, even for the smallest sizes, will take 500 volts or more without the intermediary of transformers. The winding of the rotor is independent of that of the stator, and the voltage induced in the rotor is always very low, not exceeding 100 volts during starting and only about 10 volts when the motor is in operation. The control of the motor by the operator is as simple as could be, whether with or without the automatic gear. Putting a hand-lever into a distinctly marked position is the only operation in starting and throwing this back to its initial position the only one when stopping.

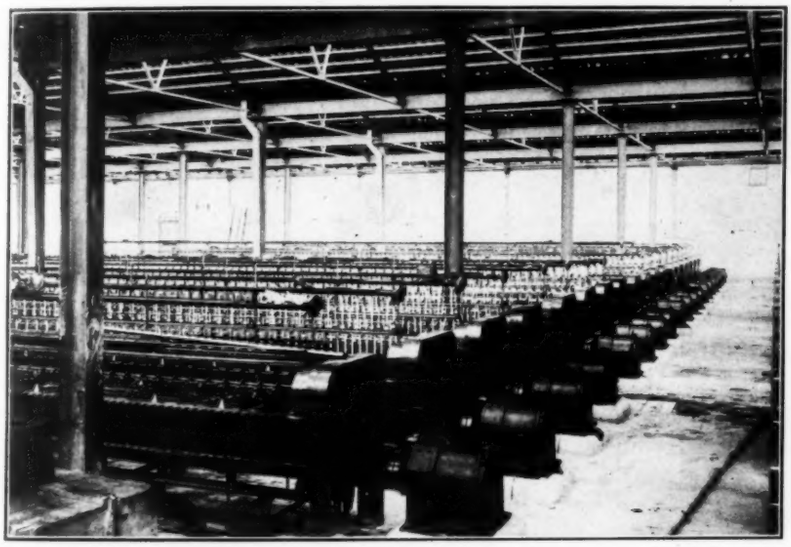


FIG. 2.—FORTY SINGLE-PHASE MOTORS DRIVING RING-SPINNING MACHINES.

In presenting this brief review of the reasons which have led to the designing and successful use of the single-phase repulsion motor, as originated in Europe by Brown, Boveri & Company, for ring spinning at variable speed, the writer does not wish to be understood as condemning other systems. On the contrary, he regards driving at constant speed by means of standard brushless induction motors as a desideratum in textile-mill service; and the probability is that, with the practical working out of certain problems peculiar to the mechanical processes of spinning, the last-named system will eventually displace all others. The principal facts in relation to this will be brought out in another article. Brown, Boveri & Company are, however, certainly to be commended for the manner in which they have worked out their system and there is no question but that it has proven very successful. Already it has had a noteworthy effect upon textile-mill operation in Europe and elsewhere, with the result of increasing competition for American manufacturers in every field where their goods are sold side by side with the product from abroad.

### Russian Railways to Electrify.

The Minister of Public Works in Russia has determined to electrify the railways in the neighborhood of St. Petersburg. The power is to be taken from the Wolkhoff River, which flows into Lake Lagoda. The power required is estimated at about 28,000 kilowatts.

### Counter-Current Braking.

The first electric Swiss railway that has definitely adopted the single-phase alternating current, the Locarno-Bignusco line, has also adopted the counter-current braking, the first instance of such adoption in connection with single-phase alternating current.

### Extensive Use of Electric Power in Paper Mills.

While steam power has held its own in paper mills ever since it superseded the water wheel, electric installations are now coming into favor. One Scottish paper-making company last year spent $75,000 in the electrification of its factory. In the new Japanese factory at Tomakomai, although the five paper-making machines are driven by steam, all the other power is electric. The mill has an electric power house of 15,000 horsepower and there are fifty-six electric motors. For the greatly increased rate of speed of paper machines the electric drive is helpful. There was difficulty at first in securing with electrical power a sufficient variation of speed from the fastest rate down to the slow traveling necessary for wire washing, felt changing, etc., particularly when different sorts of paper had to be made on the same machine. The methods now in use allow of every conceivable variation being produced without waste of current.

The majority of the new mills being erected at home or abroad utilize electric power. If the manufactory is near a central power station it may be found advantageous to purchase the necessary power from the supply company. Usually, however, paper makers find it desirable to own their own plant and to generate current for themselves. As steam is required for heating purposes in the manufacture of paper, a boiler plant is essential. The use of the steam turbine in place of the reciprocating engine is being recommended. Apart from the economical working of the turbine there is the great advantage of obtaining a large quantity of exhaust steam free from oil, which is a drawback in utilizing the exhaust steam of the reciprocating engine. Among the British engineering concerns which specialize in the making of turbo-gentrating sets, one has during the past few years carried out electric installations in paper mills in this and other countries amounting to an aggregate of over 109,100 horsepower, the largest individual plant being one of about 30,000 horsepower.

Paper makers who have reorganized their factories and have had them electrically equipped have found that resulting economies and better conditions of work made a welcome difference in the year's balance sheet.—*London Times Engineering Supplement.*

**Motor Installation in the Plant of the Allentown Cement Company.**

A cement mill in which the latest applications of electrical machinery to the manufacture of cement have been made was described in the *Manufacturers' Record*. This mill, operated by the Allentown Portland Cement Company, at Evansville, Pa., has a capacity of 2,500 barrels and arrangements are such that the output can be increased to 5,000 barrels, with no interruption in production. Alternating current is used throughout, power being generated by three three-phase 600-volt generators direct connected to Wetherill cross-compound engines.

As the rock to be used in cement making comes from the quarry, the cars on which it is loaded are taken to the crusher house on two hoists, each driven by a fifty-horsepower motor. The cars are emptied into an elevator that carries the material to a No. 10 Gates crusher, which discharges into a second elevator, that delivers the material to three No. 6½ Lehigh crushers, where it is further reduced. A 250-horsepower motor supplies the necessary power for the crushing machinery. It is interesting to note here that although individual drive was adopted through almost the entire plant, line shaft was installed in the crusher house. The reason for this was that the load on a gyratory crusher is intermittent and frequently comes on so quickly that it causes a severe shock. By using line-shaft drive a shock produced by any particular machine can be absorbed by the inertia of the other machines and moving parts of the system.

The motor for the driers is a fifty-horsepower squirrel-cage induction motor, and is belt connected to a line shaft, from which three driers are driven. Each drier is connected to the line shaft by belt drive, and the speed is further reduced through two sets of spur gears and one set of bevel gears. This motor also supplies power to the shaking-feed arrangement from the stock bins to the driers.

From the driers the material is carried to the stone storage on a belt conveyor driven by a forty-horsepower motor. A smaller conveyor driven by the same motor takes the material to the raw mill, where it is delivered to two No. 8 Krupp ball mills, each driven by a forty-horsepower motor. These mills are used in preparing the mixed raw materials for the Fuller mills. The material is discharged from the ball mills onto several elevators driven from line shafting belted to a forty-horsepower motor, which distributes the material into a storage bin over the Fuller mills. There are eight forty-two-inch Fuller mills, each driven by a seventy-five-horsepower vertical belted motor. The material is conveyed from the Fuller mills to a large storage bin over the kilns by a bucket hoist driven by a ten-horsepower motor, and is conveyed into each kiln by an inclined feed pipe, which receives its supply from the screw conveyor. There are four kilns, each driven by a thirty-horsepower motor of the wound-rotor type.

The coal for firing the kilns is brought from a hopper below the tracks and carried by an elevator and conveying system driven by a forty-horsepower motor to the top of the coal storage. The coal is conveyed by gravity into a set of rolls in the pit, which reduces the large lumps. An elevator discharges the crushed coal into two Matcham driers, from which it is again elevated and discharged into the bins over the pulverizers. The pulverized coal is carried by a screw conveyor and an elevator to the bins in front of the kilns. One 30-horsepower squirrel-cage induction motor drives the three elevators and the screw conveyor handling crushed and pulverized coal. The pulverizer equipment consists of two forty-two inch Fuller-Lehigh mills driven by a seventy-five-horsepower motor. The motor for each kiln is placed in the small pit below the surface of the concrete floor, small openings in which permit the passage of the belt to the pulley. Further speed reduction is effected through two belts and gears.

The speed rotation of the kilns is low, about one and one-half minutes to the revolution. Provisions must be made in the motor drive to vary the speed of the kiln to suit the charging conditions in burning. In some alternating-current installations, using induction motors, a motor-generator set has been provided to supply direct current for operating the motor for the kilns, but in the plant under discussion alternating-current slip-ring motors with wound rotors were chosen, the speed changes being obtained by varying the resistance in the secondary.

Two kilns discharge into a common bucket elevator, which feeds the material into the rotary coolers. There are four coolers, all operated by a fifty-horsepower motor. The two bucket elevators for these are driven by a twenty-horsepower motor. A belt conveyor takes the material from the coolers and delivers it to an elevator discharging onto a belt conveyor, which distributes the clinker to the storage.

From the storage the clinker is taken to the gypsum house by a belt conveyor driven by a ten-horsepower motor; an elevator driven by a ten-horsepower motor conveys the material to the finishing mill, where it is discharged into a rotary screen. The material which passes through then goes directly to the eight Fuller-Lehigh finishing mills, each of which is driven by a seventy-five-horsepower vertical-type motor. The coarse material is fed into a No. 8 Krupp ball mill, and the resulting product from the ball mill is discharged into the same elevator that delivers the material to the Fuller mills. The ball mill is driven by a forty-horsepower motor. Between the rows of finishing mills there are two conveyors discharging into the common elevator that delivers the material to a screw conveyor connecting the finishing mills with the storehouse; this system is also driven by a forty-horsepower motor. Three screw conveyors, all driven from a thirty-horsepower motor, carry the material from the bins in the stockhouse to the bagging-house, and a twenty-horsepower motor supplies the power for the elevator that delivers the cement to bins above the baggers. Two pairs of Bates valve bagging machines are used for bagging the cement in this, the last operation of manufacture, each pair being driven by a thirty-horsepower motor.

**Further Air-Nitrate Experiments.**

The Aktiebolaget Kemisk Industri has been formed in Sweden to complete experiments and work out more thoroughly the patented methods of Thorsell, Björne and Lunden for electrically producing nitrogen products from the air. This method is stated to require less power for a given result than those now in use in Sweden and Norway and to make possible the utilization of more expensive power. The erection of a plant at Gothenburg, Sweden, is contemplated in the course of time.

### Electrically Ozonized Air for London Tube Railways.

In a recent report an American consular officer states that one of the strongest objections made to traveling underground in London is the fact that the air is impure and often stifling. What promises to be a revolution in this particular is a plan which has recently been announced by the officials of the Central London Railway Company, according to which a system of ventilation will be installed capable of pumping daily 80,000,000 cubic feet of ozonized air into the tube stations and tunnels of that company.

One plant is already in operation, and it is hoped that similar ones will soon be completed at every station along the line. It is stated by one of the officials that the plant at each station will pump 400,000 cubic feet of air per hour into the station, or at the rate of 900 cubic feet per person per hour. The ordinary allowance in buildings is about 300 cubic feet of fresh air per person.

The air is drawn from outside through a filter screen, which removes dust and dirt and impure gases. A part of the air is then highly ozonized by being passed over highly electrified plates, the proportion of ozone in the whole being one part in 10,000,000. The air is driven by electric fans to the level of the bottom of the station, and two-thirds of it is distributed over the platform by ducts, with outlets at a height of seven feet above the platform. The remainder is driven into the tunnel. The size of the pumping plant is such that it can be installed in a chamber 10 feet by 8 feet by 4 feet, and there are two miles of duct work.

### Electrical Mine Installations on the Increase in England.

The revolution that is being brought about in mining methods, with especial reference to England, was the subject of the presidential address of E. Kilburn Scott at Leeds, England, before the Mining Electrical Engineers.

Just twenty-four years ago the first electric coal-cutters in the world were set to work at Bowers colliery at Woodlesford, near Leeds. It was a bar machine, and today there are over 600 such machines at work, and it is estimated that there are over 5,000 electrical coal-cutting machines at work in various parts of the world. Last year there were 872 machines in use in England, and the amount of coal which was cut by them was 8,825,450 tons.

In reference to legislation restricting the use of electrical apparatus in mines, Mr. Scott said electrical engineers of England had been hindered by "scare" legislation. Progress was greatly interfered with by the Electric Lighting Act.

The 1904 rules regarding the use of electricity in mines encouraged the use of a ground detector, and very useful instruments had been developed to meet the want. Mining electricians were practically unanimous as to the great utility of the ground detector, because readings could be taken daily, and by comparing them one had at once an indication when insulation was failing. With the suggested automatic cut-out of the new rules the mining electrician would not know that the insulation was failing, and it would get worse and worse until the circuit-breaker came out and the mine, or a large part of it, was suddenly shut down. The result would be a very natural temptation to so adjust the setting of the circuit-breaker that it would act only in very exceptional circumstances. Until these circumstances arose there was no indication that anything was wrong, whereas, with a leakage or ground detector, a warning would be given in good time.

### The Grönwall Steel Furnace.

Under this name a new electric steel-refining furnace has been brought out by three Swedish engineers. It is an arc furnace designed with the idea of eliminating the weak points of other types of furnace. The furnace has two carbon electrodes passing through the roof, the basic lining of the hearth forming the other electrode. It is connected through a carbon block set in a casting bolted to the bottom of the furnace. Good electrical contact is secured by a special mixture which is used as a cement. Two-phase current is used, one phase passing through each of the upper electrodes, while the bottom of the furnace forms a common return. The electrode holders for the electrodes passing through the roof have three advantages over the usual types: (1) the holder grips the electrode and also makes electrical contact; (2) the construction is simple and efficient, devoid of complicated parts and capable of standing rough usage. It is made of strong iron casting and T-irons; (3) contact is made low down on the electrode, reducing losses, through electrode resistance to a minimum.

The furnace is mounted on curved rails and may be tilted either by hydraulic cylinders or by hand, through gearing. The advantages of using two-phase current are stated to be more even distribution of heat due to better circulation and a more uniform load. When two arcs are connected in series in a single-phase furnace there is continual making and breaking of the circuit, since the breaking of one arc also breaks the current through the other. With the two arcs in different phases the breaking of one arc does not affect the other, and there is consequently less discontinuity in the supply of energy. The passage of the current through the bottom of the furnace keeps this portion from cooling and solidifying. This arrangement also produces a vertical as well as a horizontal circulation of the metal, which helps to facilitate the chemical reactions.

### Electric Mountain Railway.

The Norwegian Railway Department has been making surveys for a new mountain railway, which is to proceed from the Myrdal station, one of the most elevated points on the Bergen-Christiana Railway, through the picturesque Flaamsdal, to a point on one of the inlets of the Sognefjord. The new railway, which it is proposed to work by means of electric current from one of the State waterfalls, will, over certain portions, have to be constructed on the rack-rail system.

### Greatest Iron Producing Region in the World.

The Mesabi Iron Range in Minnesota produced in 1910 fifty-three per cent of the entire iron-ore production of the United States. The Lake Superior district, including Minnesota, Michigan and Wisconsin, produced 81.5 per cent of our total iron-ore production.

The increase in last year's production of coal over that of 1909—40,781,762 tons—is equal to nearly three times the total annual production of the United States at the beginning of the Civil War, according to the figures of the United States Geological Survey.

# Electric Lighting and Illuminating Engineering

**Comparison of Gas and Electric Lighting from the Hygienic Standpoint.**

The question of the relative hygienic merits of gas and electric lights and the unreasonable attitude of the gas interests on the subject was treated quite fully in a recent issue of *La Lumiere Electrique*, of Paris. The attitude of the gas interests mentioned refers to their contention that ventilation is aided by the heat of the flame. Carbon dioxide and the moist air exhaled from the lungs of persons in the room are carried up by the current of air which the flame produces; the air is carried past the flame and a good part of the organic particles are claimed to be burned or destroyed.

However, Mr. Schlesinger, whose views are taken up, says that the carbon dioxide formed by the burning gas jet is not the most active factor in vitiation of air, and that the chief advantage of electricity over gas is not from this point so much as from a standpoint of humidity and temperature rise. Considering a case where a number of people are crowded in a hall there is, it is true, a vitiation of air from exhalation of the breath and the consequent increase of carbon dioxide. If the room were cool the effect would not be nearly as bad as if with the same number of people the room temperature were increased by burning gas jets or other means. The perspiration in the second case would be active to a much greater extent and the air would be unbreathable in a much shorter time.

At the present time no exact data seems to be available on just what chemical substances are most active in vitiating the air, but there are among others butyric acid, acetic acid, etc. The proportions may vary widely. On the other hand the causes which favor the formation of such products are well known; temperature and humidity each play an important part.

The influence of temperature is well known. As for humidity, its effect may be explained as follows: when the atmosphere is very humid the natural evaporation of the body is slower, and consequently the body temperature is raised, which favors cutaneous exhalation. This theory is one of the latest which has been taken up by many hygienists as the best explanation of the vitiation of air, the belief being that it is not so much a matter of an excess of carbon dioxide as too great humidity and too high temperature.

The problem resolves itself into two questions as follows: (1) What is, all other things being equal, the influence of each method of lighting on temperature and humidity of a room? (2) What are the changes of the air, and the gases which are caused by each method?

In answer to the first question it may be said that no two methods of lighting have the same humidifying or heating effect. According to Professor Rubner the Welsbach system only produces a quarter of the heat that the gasoline systems do, and that the humidity of the first is but a third of the latter. Electric light has about one-sixth the heating effect of gas, and of course no humidifying effect. Tests made by Kramer are given in table I.

TABLE I.
Quantities of water and carbon dioxide set free per 100 candlepower in a given time.

| Mode of Lighting | Water Kilograms | $CO_2$ Kilograms. | H. Produced Calories |
|---|---|---|---|
| Electric Arc..... | 0 | Traces | 57 |
| Incandescent Lamp..... | 0 | 0 | 200 |
| Gas Mantle .....9.11 | | 0.12 | 1,000 |

M. Reitschel estimates that the quantity of heat per candlepower given off by a carbon-filament incandescent lamp is not more than one-third or one-fourth that given by a Welsbach lamp, and about one-half that found in the case of an inverted mantle lamp. It must be remembered that these figures concern the carbon-filament lamp, and not the metallic-filament lamps, which have about one-third the heating effect of the carbon lamps. Their heating ratio to the upright Welsbach and the inverted mantle lamps would be about one-ninth to one-twelfth, and one-sixth to one-seventh.

Experience has shown that owing to the smaller heating, electric lights may be brought nearer to the person using the light, or the object to be illuminated, so that an electric light of small candlepower is as useful as a gas light of much greater candlepower which must be placed further away. Thus a gas light of sixty or eighty candlepower would be necessary in some places to take the place of a twenty-five or thirty-candlepower electric light.

As for the humidifying effect, this is naturally zero in the case of an incandescent electric lamp, but quite appreciable in the gas burners. The water vapor in the atmosphere is actually considerably increased and the relative humidity also increases as the temperature rises, so that the effect is decidedly harmful.

In a hall at Nuremberg, Germany, the air was tested after incandescent lamps had burned and after gas lamps had been used. The dimensions of this hall were: length 14.6 meters, width 7.4 meters, height 4.6 meters. First five gas lights were tested and then five 100-candlepower metal-filament incandescent lamps, each arrangement being fixed in the same way, and giving nearly the same lighting. Finally four arc lamps, giving about double the illumination, were tried. In the first two cases the average lighting was between fourteen and nineteen lux. Before each trial the room was ventilated for half an hour. No one had access to the room during the tests, which each lasted eight hours.

The results were as follows: Gas lighting caused a temperature rise of three times as much as electric incandescent lights. The quantity of water vapor set free by the combustion of the gas was so great that in spite of the rise in temperature the degree of humidity increased fourteen per cent. There was, on the contrary, a diminution of the degree of humidity of about five per cent with incandescent electric lamps and three per cent with arc lamps.

These experiments show clearly that electric lighting causes the least rise of temperature and that it produces an actual diminution of the degree of hu-

midity, while gas on the contrary sensibly increases at the same time the degree of humidity and the temperature, favoring consequently the vitiation of the air by persons present in the room. From this point of view it follows that electricity is much more healthful than gas.

The answer to the second question is still more favorable to electric lighting. According to Rubner it is necessary with gas lighting to take account, in addition to the carbon dioxide and water vapor, of the other gases and vapors formed (sulphuric acid, nitric acid, etc.), the presence of which diminish the proportion of oxygen in the atmosphere and contribute to its vitiation. Moreover, such gases as these cause an irritation of mucous membranes and aggravate catarrh and similar diseases. To this influence may also be attributed the deleterious effects to plant life, furniture, curtains and books.

Dr. Viereck in an article on the dangers of gas lighting estimates that, in spite of the care given to its preparation and scrubbing, gas always contains a number of substances, some toxic, others caustic, some containing cyanogen and some sulphur, such as carbon bisulphide, ammonia and sulphurous anhydride. Damp objects absorb these gases, which exercise on them a very harmful influence. Thus the sensitive respiratory membranes with which the air we breathe comes in contact, the plants, decorations, and other things suffer from gas lighting when the gas burned contains too great quantities of sulphur.

Moreover, according to Mr. Schlesinger, at least ninety-five per cent of the gas burners in houses, restaurants, etc., do not work perfectly from lack of attention and adjustment; they produce incomplete combustion and sensibly increase the proportion of harmful gas that is freed. All this agrees with results of the tests made at Nuremberg, which have been referred to previously. The reports of these tests said "it was extremely disagreeable to remain in the hall at the conclusion of the tests made with gas burners, while after electric lights had been burned this was not found to be the case."

Mr. Schlesinger took up the principal arguments which are set forth by the partisans of gas lighting, which rest principally on the ventilation effect that they believe gas lighting to produce. While admitting that this ventilation might be useful, its effect could only be to correct in a small measure the vitiation of the atmosphere due, as has just been shown, to gas lighting. As for electric lighting, if it does not produce ventilation the hygienic conditions of a hall provided with this mode of lighting will not, granting that it does not have any effect on the atmosphere, be any less favorable than those of a hall lighted by natural sunlight, and the healthful effect of this ventilation caused by gas lighting seems, according to the Nuremberg experiments, to be negligible. The proportion of carbon dioxide of the different layers of the air of the hall after test was from thirteen to nineteen times more than its original content. The only effect of ventilation due to the flames was to increase the proportion of carbon dioxide in the upper layer. There is a grave inconvenience in lighting theaters and exhibition halls, for the spectators in the upper rows find that as a result of the upward movement of the gas caused by the working of the flames, the air is very bad indeed. With electric lighting, on the contrary, the condition of the different atmospheric layers of the hall are approximately the same, as certain experiments conducted a long time ago in a theater in Munich showed.

As for the hypothesis of the partisans of gas lighting that certain organic particles are drawn in by the current of hot air and destroyed by the flame itself, that does not rest on any certain foundation. There seem to have been no experiments carried out in this direction, and it is quite probable that only the particles which come in direct contact with the flame are burned. Moreover, the acids which constitute the principal elements of these particles possess very high boiling points and do not seem to undergo any modification unless they are brought into direct contact with the flame and are submitted to a temperature which is somewhat higher than that of the ordinary gas lamp. A very small proportion of organic particles contained in a hall would probably burn but this would hardly compensate the bad effect produced by the combustion of gas.

Finally, outside of the very grave danger of asphyxiation which gas lighting presents when from one cause or another (leaks, taps carelessly turned off, etc.), a quantity of gas gets into the interior of the room there is the additional danger, according to Mr. Schlesinger, that even though precautions are taken there are apt to be pipes which are not perfectly installed and will leak and lead to explosion.

Mr. Gruber estimates that illuminating gas becomes harmful when the gas in the atmosphere is present in the proportion of 0.05 per cent or more.

Mr. Brunte holds that the presence of gas in the atmosphere can be detected by its odor when the proportion passes 0.01 per cent or at most 0.02 per cent. This sum refers to the old kind of gas. At the present time certain gas-light companies furnish a gas two times as rich in carbon monoxide as the old gas, and the odor is, of course, much less noticeable than formerly and in just that proportion is it more dangerous. Moreover, the olfactory nerves are easily accustomed to the odor of gas, so that a person in a room for some time cannot recognize the presence even though it may surpass a dangerous proportion. According to Mr. Schlesinger a chronic intoxication whose symptoms are nervousness and which is often attributed to other causes, results. It is quite true that it is difficult to determine the exact importance of this chronic poison by lighting gas but its influence is said to be far from a negligible one.

The preceding considerations definitely establish the very great superiority of electric lighting over gas lighting from a hygienic point of view, but there consists yet another element of comparison and that is a very great convenience and safety. That relates to the dangers of fire which result from the different systems of lighting. The number of fires caused from the use of gas lights were from an investigation in Prussia found to be over five times as great as those caused from the use of electric lights in the same time.

### Statistics of Illuminating Gas.

A preliminary statement of statistics, gathered by the Bureau of the Census, of establishments engaged in the manufacture of illuminating and heating gas has just been issued. The number of establishments in 1909 is given as 1,296, with a combined capital of $915,537,000. The output in thousands of cubic feet was 150,835,793.

### "The Fair," a Large Chicago Department Store, Changes from Arc to Tungsten Lamps.

The changing over of interior lighting installations from arc lamps to tungsten incandescent lamps has become so common in the last few years as to excite little curiosity or comment. The recent change of this character made by one of the leading department stores in Chicago, was on such a large scale and has produced such excellent results that it is worthy of special notice.

"The Fair" is one of the oldest and largest department stores in Chicago. It occupies one-half of a city block with its fireproof eleven-story building fronting on State, Adams and Dearborn Streets. Half of the basement and all of the first seven stories are devoted to the salesrooms of the thirty odd sales departments. The remaining floors are occupied by the workshops, storage, shipping and other service departments. Practically all of the building was formerly lighted by means of 6.5-ampere inclosed direct-current arc lamps. The illumination from these was not very satisfactory, in many places being inadequate, in all cases unsteady, not uniform, and cold in tone and color. Besides the frequent trimming necessary was both expensive and annoying.

A few months ago tests were made of the old equipment and of various types of high-power incandescent lamps. As the result of these tests it was decided to replace all the arc lamps by means of high-candlepower tungsten lamps, using the same outlets, one in the center of each rectangular bay. The seven merchandizing floors were equipped as follows: first floor, 500-watt lamps 12.5 feet above the floor level; second, third and fourth floors, 400-watt lamps 10.7 feet above floor level; fifth, sixth and seventh floors, 250-watt lamps 9.6 feet above the floor. The reduction in the sizes of lamps on the upper floors was due both to diminished height of ceilings and to the nature of the goods sold; on the first four floors are located the various clothing and textile-goods departments that require a higher illumination than the furniture, house-furnishing and grocery departments on the three upper sales floors.

On each floor, except the seventh, about 130 outlets were equipped with large tungsten lamps. About one-half of the seventh floor was similarly equipped; the remainder of this floor, occupied as a restaurant, had already been provided with incandescent lighting. A total of about 850 tungsten lamps was installed. These replaced the same number of arc lamps that had averaged nearly 680 watts apiece, thus making a very decided energy and maintenance saving on the entire installation although the illumination is very much improved. All of the new lamps are of the bowl-frosted Mazda type, about one-half being supplied by the General Electric Company and the remainder by the General Incandescent Lamp Company.

The new fixtures are simple chain pendants furnished by R. Williamson & Company. In the two main aisles of the first floor, four twenty-watt tungsten lamps were placed around each ceiling canopy to serve as markers of the most direct ways to the main entrance and exit doors. Each of the large tungsten lamps is not only bowl-frosted, but covered by an Alba distributing bowl-type shade, furnished by the Macbeth-Evans Glass Company, thus effectively eliminating any glare effect and giving a uniform distribution of soft, warm, sunlight-approximating light that has been found excellent for color matching and general merchandising in all departments. Electrical energy is supplied by the Commonwealth Edison Company, under whose direction the rehabilitation of the lighting equipment was made. The results of the latter have pleased the managers, employees and patrons of the store.

### Tungsten.

The mineral tungsten has been known for many years, but only comparatively recently has it become of economic importance. The most important use, according to Frank L. Hess, of the United States Geological Survey, and the one which makes tungsten mining on an extensive scale possible, is as an alloy for tool steel. Lathes using tools made from tungsten-steel may be speeded up until the chips leaving the tool are so hot that they turn blue, an operation which would ruin the temper of high-carbon steel. It is stated that about five times as much can be done with lathes built for such speed. The amount of tungsten used for incandescent-lamp filaments is rapidly increasing.

### Three Miles of Ornamental Street Lighting in Wichita.

Three miles of business streets in Wichita, Kans., are to have every wooden and other pole removed and a new lighting system installed with lamps on ornamental iron posts to be used jointly for trolley support and street lighting. Magnetite arc lamps will be placed about 100 feet apart on each side of the streets. Corner lamps and the middle lamps in long blocks will burn all night, the others until midnight only. There will be 41 all-night lamps and 212 in the second group. One block which does not have a street-car line will be illuminated by five-lamp tungsten clusters 86 feet apart. The city will pay for the cost of operation, which is estimated at $10,126 per annum for the initial installation as outlined above.

### Philadelphia Section Has Live Meeting.

The regular monthly meeting of the Philadelphia Section of the Illuminating Engineering Society was held in the Assembly Hall of the Philadelphia Electric Company's building, on November 17.

The usual dinner preceding the meeting was held at Mosebach's Restaurant, and was attended by forty-eight members and guests. After the dinner, the party adjourned to the Lecture Hall, to examine the exhibition of the latest type of incandescent gas lamps and appliances. These appliances were explained and demonstrated later in the evening by R. F. Pierce, of the Welsbach Company.

The meeting was called to order at 8 p. m. by Joseph D. Israel, chairman, 122 members and 66 visitors being present.

The first speaker of the evening was E. J. Brady, who delivered a paper on "A Comment on the Application of Photometric Data to Interior Illumination." This paper, while short, proved very interesting and was followed by some little discussion.

The second paper of the evening was delivered by George S. Barrows on "Natural Gas, its Production and Utilization." This paper, which was profusely illustrated with lantern slides, proved of great interest to those present.

The papers were discussed by C. O. Bond, I. N. Knapp, George B. Muth, Professor Rowland and others.

The meeting, which was one of the most successful ever held in Philadelphia, adjourned at 10 p. m.

# Telephony · Telegraphy and Wireless

### Block-Signal Conference In Indiana.

Members of the Block Signal Committee held a conference with the Indiana Railroad Commission Novemb r 14 for the purpose of reaching some agreement in regard to the installation of block signals on the electric lines of the state. Because of the fact that various experiments carried on in the vicinity of Indianapolis have not tested the proposed block system thoroughly, no definite decision was reached, and another meeting was decided on for December 4.

According to a recent order of the Commission, all interurban lines in the state were to be equipped with some sort of block signals before January 1, 1912, but because the several systems have not been tried out sufficiently or to the entire satisfaction of the committee representing the traction lines of the state, the time was extended. It was stated by Mr. Brady, chairman of the committee, that a decision would likely be reached by the next meeting.

### The Eiffel Tower Wireless Station.

All the rooms for the apparatus used at the Eiffel Tower Station are underground in order that the Champ de Mars may not be interfered with. There are three transmitting stations, two of which work with intermittent chargings which are ready for use in from one to two minutes. The first transmitting station is intended for small distances only, and mainly for communication with the French coasts and Algiers. It works with ten kilowatts. The transformer, resonator, spark inductor and condensers are perfectly damped with felt insulators. The second transmitting station, which is the largest if not the most modern in use, requires forty kilowatts and is fed by an alternating current of 42 periods and 220 volts. The condenser group has a capacity of 0.7 microfarad, and consists of seven Moscicki tubes arranged in cascade. They are designed for a maximum voltage of 120,000, but 90,000 is not exceeded in normal work. The antenna is excited by a shunt. The two zinc cylinders of the exciter are full and are about 10 inches in diameter and 20 inches long. Each of them is fixed on an opaline plate and one can be altered in position to permit regulation of the length of the spark. Both are rotated by an asynchronous motor. The average length of spark is about 1.5 inch.

For this equipment the antenna wire is a galvanized steel cable weighing 2.5 tons and 0.28 inch in diameter. Each of the six wires is 460 yards long, and is fixed at the summit of the tower by four special insulators. The earthing consists of zinc bands, having a total surface of 720 square yards. The antenna resistance is 13 ohms, the normal working current 46 amperes.

The third transmitting station works with singing sparks and requires ten kilowatts with an alternating current of 600 cycles.

The spark length is about two-thirds of an inch and the current in the antenna about 60 amperes.

Besides its special military service, the Eiffel Tower is employed in sending time signals and weather reports to ships within 2,500 miles distance, and also to facilitate geographical measurements. — *Electrical Engineer*, London.

### Wireless for South Seas.

The Argentine government has decided to build a large wireless station on New Year Island at the southern end of Tierra del Fuego, to establish communication with the South Polar expedition of the *Deutschland* during its stay in the Weddell Sea (Falkland Islands). In this way communication between Germany and the expedition will be insured even after it is among the south-polar ice.

### Ohio Telephone Tax Raised.

The Tax Commission of Ohio has increased the tax value of Ohio telephone companies from $15,551,398 to $60,914,420. The valuation of the Central Union Telephone Company's property is raised from $3,677,000 to $13,485,530.

### Telephoning Through Water Without Wires.

The following paragraphs in regard to tests of an instrument to telephone through water without wires appeared in a recent issue of a prominent English technical publication.

Exhaustive tests have recently been made by A. W. Sharman with instruments invented by him for telephoning through water without wires. The microphone used in speaking is connected in series with a battery of four or five dry cells and an impulse coil, the coil being of special construction and giving very short, induced currents of high potential, which are communicated to the water by two wires connected to the terminals of the coil and terminating in plates buried in the sand or submerged in the water. Two similar plates, conneced direct with a very-low-resistance telephone receiver, enable the speech to be "picked up" at distances of a mile and more.

The speech transmitted through the water has been very distinct, and the system has shown good possibilities for use as a means of verbal communication between two ships, such as a battleship and a submarine. The effect is very directional, and another advantage is that with a small tuned buzzer telegraphic signals can be transmitted through the earth or water for a distance of seven miles. The primary energy required is extremely small, four watts suffieing to telephone over a distance of two miles.

### Chicago Automatic Telephone to Control Long-Distance Company.

The independent telephone promoters who operate the automatic telephone system in Chicago have decided to purchase the controlling interest in the stock of the Interstate Independent Telephone & Telegraph Company. This will give Chicago, through the automatic telephone, independent long-distance connection with additional points.

The receivership into which the Interstate Company was thrown a few months ago by the bondholders and minority stockholders will thus end.

# Questions and Answers

All readers of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN are invited to submit questions and answers to this department. Correspondents are requested to send full name and address. This, however, will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered.

Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question. Answers will be published in a subsequent issue.

QUESTIONS.

No. 26.—ELECTROLYTIC RECTIFIER.—Please describe and give sizes of the simplest form of electrolytic rectifier consisting of aluminum and lead plates in ammonium phosphate solution, to be used for charging (at least two at a time) automobile ignition batteries on 110-volt alternating-current circuit.—J. S., Alameda, Cal.

No. 31.—ELECTROMAGNETIC SWITCH.—I want to make an automatic switch to take the place of a double-pole, double-throw switch. Its upper contacts are to connect to a 110-volt dynamo and the lower contacts to a 110-volt storage battery. It must be arranged so that a coil across the dynamo circuit holds the armature to the dynamo contacts and that when the dynamo current is off the armature drops by gravity and thus lights the lamp circuit from the battery. When the dynamo starts up again the reverse operation must take place. Please give design of such a switch. What size and number of turns of wire must be put on the coil to give the armature sufficient travel and lifting power? What must be the size of the armature and core? Could the coil be connected directly across 110 volts without a lamp in series?—C. A. J., Minneapolis, Minn.

No. 33.—ELECTROPLATING BRASS.—Can brass be electroplated on cast iron? If so, what solution is used and what strength of current?—H. M. C., Little Rock, Ark.

No. 34.—ALUMINUM-CELL LIGHTNING ARRESTER.—Can aluminum-cell lightning arresters be installed outside the station where the coldest winter weather is around zero Fahrenheit? At what temperature are they liable to freeze up?—N. R., Knoxville, Tenn.

No. 35.—FLAME LAMPS ON FLUCTUATING VOLTAGE.—Which kind of arc lamp burns more steadily where the voltage fluctuates five or even more per cent around normal, the magnetite arc or the flaming arc?—B. H. S., Youngstown, Ohio.

ANSWERS.

No. 27.—HEATING A NEEDLE ELECTRICALLY.—I should like to know how to heat by electricity, from one end only, a needle the size of a darning needle, which must have its other end entirely free from any kind of an object.—N. D. R., Kokomo, Ind.

The form of needle used by surgeons in cauterizing is double, the current flowing down one side and up the other, the end consisting of a blunt turn, rather than a point, although this end can be pointed when necessary. In this case the electrical connections are both made at one end of the needle and the current can be regulated to give any heat that may be desired. Instead of using two separate pieces for the needle it would be possible to split an ordinary needle down almost to the end, and by inserting a sheet of mica insulate the two parts, so that the current would have to traverse the entire length. It is also possible to heat the needle from one end, either by letting the current traverse a short length near this end or by surrounding the needle with a heating coil. In either of these cases, however, it will be difficult to secure a very high temperature at the other end of a steel needle on account of the low conductivity of the steel. By making the needle of copper or silver a higher temperature could be obtained.—T. S. G.

No. 29.—MULTIPLE-UNIT SYSTEM FOR ALTERNATING-CURRENT RAILWAYS.—Is it possible to operate a number of cars in a train on the multiple-unit system when alternating current is used on the trolley?—J. Q. R., Evansville, Ind.

It is not only possible, but done every day. Many alternating-current locomotives are made up of two distinct unit locomotives that may be operated separately or on the multiple-unit principle. The same can be done with any number of motor cars. Multiple-unit control can be applied to single-phase and three-phase cars as well as to any direct-current system.—B. A. M.

No. 32.—TESTING TELEPHONE CABLES.—(1) How can I locate cable trouble with a bridge, when the entire cable is made up of perhaps three or four different sized conductors, knowing only the total length of the cable? (2) On an underground cable system in which will I get the least difference of potential between car tracks and cable, with the trolley positive or the rails positive and why?—A. T., Duluth, Minn.

(1) Two interpretations may be given to the first question, which is not clear. If it means that the cable is a multicircuit cable having pairs of various sizes of wire, each of which is continuous throughout the known length of the cable, then the problem is very simple; a loop should be chosen to include the faulty wire with a mate of the same size, and the resistance to the fault measured by either the Murray or Varlep loop methods. From the measured resistance of the loop and its known length the resistance per foot can be calculated and then the distance to the fault. However, if the question is interpreted literally to mean that each circuit consists of several unknown lengths in series of different sizes of wire, with the total length only known, then no more reliable solution than guesswork can be used. Such a problem is unusual, because the records should show the exact make-up of cables. (2) It would not make much effect on the value of the potential difference, but it would, of course, reverse it. No trolley line is now run with the rails positive and the trolley wire negative, because this was found to vastly extend the zone subject to damage from electrolysis action on underground cables, pipes, etc. This damage occurs where the current leaves the cables or pipes to return to the rails; these points would therefore be widely scattered and remote from the power house, where it would be difficult to relieve the trouble.—J. M. L.

## BOOK REVIEWS.

"The Elements of Electrical Transmission." By Olin Jerome Ferguson. New York: The Macmillan Company. Cloth, 457 pages (5½x8½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $3.50.

The title of this book only partially covers the subjects that are treated, there being chapters on switchboards, generation, measurements and contract rates, and line phenomena in addition to chapters on subjects that would be logically grouped under the general title of "Transmission." These include conductors and insulation, insulating supports, poles and towers, aerial line construction, underground line construction, circuits, and distribution. All subjects are treated in a rather elementary manner, the author intending the treatise as an elementary textbook for schools and colleges. Under the chapter treating of line phenomena the author has included discussions of subjects that are not available elsewhere; these include self-induction and capacity of polyphase circuits as derived from single-phase circuits, line calculations, standing waves, traveling waves, curve calculations, etc. The matter of corona is discussed but not analyzed minutely, rather it has been simplified as much as is consistent with the fundamental conceptions of the phenomenon. In the chapter upon distribution, there is summarized in clear statements the chief characteristics of various units which go to make up the load upon an electric system and will determine for it its distinctive features. The text is illustrated throughout with views of modern apparatus and diagrams and circuits that aid the reader in gaining a better understanding of the subject.

"Lamps and Shades in Metal and Art Glass." By John D. Adams. Chicago: Popular Mechanics Company. Cloth, 114 pages (4½ by 6½ inches), illustrated. Supplied by the Electrical Review Publishing Company for fifty cents.

This book has been written as a handbook for amateur craftsmen interested in art-glass and metal lamps and shades. Complete instructions supplemented by detailed drawings are given for making a variety of designs with the least expenditure. Four different kinds of construction are treated, namely, built-up shades, soldered shades, etched shades and sawn shades. The designs include drop lights, reading lamps, dining-room domes, mission chandeliers, etc.

## FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

AURORA, ELGIN & CHICAGO.

The Aurora, Elgin & Chicago Railroad Company report for the month of October and four months ended October 31, 1911, compares as follows:

| | 1911. | 1910. |
|---|---|---|
| October gross | $156,741 | $154,359 |
| Operating expenses | 85,448 | 85,782 |
| October net | 71,253 | 68,576 |
| Interest and taxes | 36,438 | 33,779 |
| October surplus | 34,815 | 34,796 |
| Four months gross | 699,716 | 677,074 |
| Operating expenses | 354,181 | 344,048 |
| Four months net | 345,535 | 333,025 |
| Interest and taxes | 145,727 | 132,440 |
| Four months surplus | 199,807 | 200,584 |

KINGS COUNTY ELECTRIC LIGHT COMPANY.

The report of the Kings County Electric Light & Power Company for the month of October and ten months ended October 31, 1911, compares as follows:

| | 1911. | 1910. |
|---|---|---|
| October gross | $ 411,685 | $ 355,238 |
| Expenses | 199,611 | 172,712 |
| October net | 212,074 | 182,526 |
| Charges and depreciation | 128,558 | 112,790 |
| October surplus | 83,516 | 69,736 |
| Ten months gross | 3,855,217 | 3,501,741 |
| Expenses | 1,932,938 | 1,692,528 |
| Ten months net | 1,922,279 | 1,809,213 |
| Charges and depreciation | 1,154,838 | 1,046,254 |
| Ten months surplus | 767,441 | 762,959 |

SUSQUEHANNA RAILWAY, LIGHT & POWER.

The Susquehanna Railway, Light & Power Company report for the year ended September 30, 1911, compares as follows:

| | 1911. | 1910. |
|---|---|---|
| *Proportion | $509,930 | $377,149 |
| Interest on securities | 53,514 | 59,044 |
| Miscellaneous other income | 37,588 | 17,924 |
| Total income | 601,033 | 454,118 |
| Preferred dividend | 217,960 | 204,610 |
| Balance | †383,073 | 249,508 |

### General Electric Gets Panama Contract.

The General Electric Company was the lowest bidder for forty electric locomotives for pulling ships through the Panama Canal. The total contract amounts to about $500,000.

### Independent Companies Sell.

It is reported that in a recent transaction the holdings of Ohio men in more than fifteen independent telephone companies operating in New York State were sold to the American Telephone & Telegraph Company. Although details have not yet been given out, it is said that more than $3,000,000 was paid for the securities.

*Proportion of surplus earnings of subsidiary properties represented by their stock controlled by the Susquehanna Railway, Light & Power Company after deduction of all charges.

†Equal to 5 per cent on $4,198,000 outstanding common and an additional 2 per cent on the combined common and preferred stocks, as, after the payment of 5 per cent dividends on the common stock, the preferred will share equally with the common in non-cumulative dividends up to 7 per cent.

## AMONG THE CONTRACTORS AND SUPPLY MEN

THE G. B. NELSON COMPANY, Ames, Iowa, received the contract for installing sixteen electroliers in Story City, Iowa.

THE WALLICHS & ROUGHEN ELECTRIC CONSTRUCTION COMPANY, Fond du Lac, Wis., has recently entered the contracting field in that city.

THE WYANDOTTE ELECTRICAL ENGINEERING SUPPLY COMPANY, Kansas City, Kans., has opened an office at 520 Minnesota Avenue. Edward Kaufman is manager.

THE ELECTRIC SUPPLY COMPANY, Sioux City, Ia., has been awarded the contract for conduit and wiring in connection with the illumination of the tower clock in the United States Post Office, Sioux City, at $390.

W. A. McNALLY COMPANY was awarded a contract for installing a street-lighting system in Pasadena, Cal. The contract includes the lamp posts and underground conduit system, amounting in all to $15,000.

THE STRANG ELECTRIC COMPANY, Philadelphia, Pa., has been awarded the contract for work in connection with the lighting fixtures and elevator in the United States public building, Trenton, N. J., at $152.50.

W. W. GALE & COMPANY has been awarded the contract for installing fixtures in the United States Post Office, New Haven, Conn., at $107. The company will also wire the building, the bid for this work coming to $367.50.

THE EVANS-DICKSON COMPANY, Tacoma, Wash., has been awarded a contract by the City Council of Pasco, Wash., for furnishing and installing eighty-four ornamental three-cluster light standards, at a price of $5,980.

THE WOODILL-HULSE ELECTRIC COMPANY, Los Angeles, Cal., has been awarded a contract, at $2,894 for the installation of ornamental lights and electrical work for the ornamental fence to be constructed around the County Detention Home.

### Cuban Iron Ores.

The shipments of Cuban iron ores show the record-breaking output for 1910 of 1,417,914 long tons. The ores are obtained from deposits near Santiago.

# New Electrical and Mechanical Apparatus and Appliances

### Bristol's Frictionless Ink-Type Recording Instrument.

Illustrated description of Bristol's patented semi-transparent smoked-chart recorder was printed in our issue of January 4, 1908. Although these recorders are fundamentally simple in their construction and hundreds are in daily service, there has been a call for a recorder in which the record is made with ink. To meet the demand for a frictionless ink-type recording instrument to parallel the smoked-chart recorder as near as possible in fundamental simplicity and to accurately record fractions of millivolts and adapted for use as a recording electric pyrometer, the instrument illustrated herewith has been developed and placed upon the market by The Bristol Company, Waterbury, Conn.

These instruments have been thoroughly tested out in practical service for two years past and are the result of several years of study and experience with an original patented[1] design of the frictionless ink recorder, using a hinged electrical movement carrying a retaining receptacle for marking fluid, which extends over the path of the recording tip and is provided with means for periodically making contact with the source of marking fluid and the chart. Fig. 1 shows the recorder ready for operating. Fig. 2 is an interior view showing the galvanometer case hinged to the back of the instrument and carrying the inking pad in front of the recording arm. Fig. 3 shows the sensitive electrical movement swung to one side for convenience in removing the record and inserting a fresh chart. A capillary gold tube open at both ends is carried at the end of the recording arm at right angles to the surface of the chart. The inking pad is suspended from the case of the electrical movement and is curved to correspond with the arc covered by the motion of the end of the recording arm.

FIG. 1.—RECORDER READY FOR OPERATION.

FIG. 2.—INTERIOR, SHOWING GALVANOMETER CASE.

When the movement is swung back into its operating position as shown in Fig. 2, the recording arm can swing free, accommodating itself to the position corresponding to the delicate current which is to be measured. The clock which revolves the chart at the desired speed also automatically presses the inking pad toward the chart every ten seconds, bringing one end of the capillary tube into contact with the chart, and the opposite end simultaneously into contact with the inking pad. A fine dot of ink is left on the chart and the capillary tube is replenished with ink from the pad. The recording arm thus carries a constant supply of ink, and its perfect balance, which is very important, is always maintained. The electrical movements used in these recorders are made especially for the purpose by the Weston Electrical Instrument Company.

Although the most important applications of these recording instruments have been for pyrometers, they have also been used for electrolytic research, recording voltmeters and recording shunt ammeters.

### A New Machine Tool.

Much has been written pertaining to the problem of boring square holes, and the attempts towards the construction of a practical tool for this class of work have been numerous. The R. K. LeBlond Machine Tool Company of Cincinnati, Ohio, after careful study of the subject, has come to the conclusion that this work can only be done satisfactorily with a special machine tool, in which the arrangements for cutting square holes are embodied in the design, and thus guaranteeing absolute rigidity and accuracy.

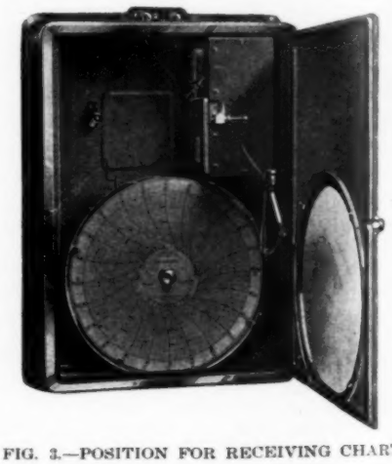


FIG. 3.—POSITION FOR RECEIVING CHART.

Considering however, that a machine, which would do nothing else but cut square holes, would be too great an investment to many customers, the Company has designed a combination machine tool which is not only adapted for milling square holes, but also possesses all the features of a standard milling machine.

The machine is designed along the lines of the LeBlond No. 2 plain milling machine with such changes as are of advantage to the successful opera-

1 Patented by William H. Bristol, April 13, 1909.

tion of the square-hole cutters. The principle used in this work is the same as employed in other devices, namely, the revolution of a triangular shaped bit, similar to an end mill, in a stationary master guide, which in appearance is much like a regular drill chuck. Entirely different from all previous devices this stationary guiding chuck is fastened directly to the column of the machine by means of a flange, which entirely eliminates all the former troubles of lost motion.

The cutter receives its motion from a special driving member which is fastened to the nose of the spindle.

As the attachment for cutting square holes projects considerably beyond the nose of the spindle, it would on a standard machine decrease the working space in front of the cutter. Therefore, the column bearing the main spindle has been set back to gain the distance taken up by this projection, thus maintaining the full working range of the table.

### Bronzing Cast Iron.

A foreign journal gives the following process of bronzing cast iron without covering it with a metal. Thoroughly clean the metal and rub it smooth. Apply evenly a coat of sweet oil or olive oil. Heat the iron, being careful that the temperature does not rise high enough to burn the oil. Just as the oil is about to decompose, the cast iron will absorb oxygen, and this forms upon the surface a brown-oxide skin which holds securely, and is so hard that it will admit of a high polish, thus giving it the appearance of bronze.

### Universal Shear for Channels, Angles and Plates.

The American machine designed to cut the various channels and angles required in shipbuilding seen in Figs. 1 and 2 was built at Covington, Va. This machine was constructed for the marine department of the Maryland Steel Company, Sparrows Point, Md., and is intended for the shearing of channels, angles or plates.

It may be stated that the most novel feature in the design of this universal shear lies in the combination of four tools in one compact unit. It is provided with a coping attachment at one end, a plate shear at the other and two angle shears in the center of the frame. These angle shears operate at an angle of forty-five degrees, thus securing a vertical and horizontal shearing action. Each shear is controlled by its own clutch, and the machine may be operated by different groups of men, all working at the same time without interfering with each other. The angle shears in the center have a capacity for cutting channels to 15 by 0.75 inch, and 6 by 6 by 1 inch or 8 by 8 by 0.75-inch angles.

The plate shear has a capacity for material up to one inch in thickness, and channels or angles may be cut either square or at an angle for mitering. It is of interest to note that the four tools are driven by one motor, which develops twenty-five horsepower. This motor is mounted at the top of the machine in the center, as shown in the illustration, which is a view taken from the rear to more clearly show the general arrangement of the driving gearing and the automatic stop clutches. A pinion on the motor armature shaft engages a large gear located on the intermediate shaft on which two flywheels are mounted, one at each end. The motion is transmitted from this intermediate shaft to a second shaft just below it, which carries a pinion engaging with the two large gears which operate the central or angle shears. These two gears are also connected through pinions to the large driving gears of the coping and plate shears at the ends.

There is a stop motion used, which automatically throws out a clutch on each shear when the latter reaches its highest point. To again start a shear it is simply necessary to pull a chain, which is suspended at a convenient point. These chains are connected with the single-revolution clutches, through counterbalanced levers as shown. For the coping attachment, which may also be used for punching, the stop mechanism is adjustable so that the plunger may be stopped at any point of its down stroke. This allows the tool to be brought close to the work, so that the latter can be adjusted.

Semi-steel castings are used for the frame, plungers, clutches and all parts subject to shock while hammered-steel shafts containing from 0.4 to 0.5 per cent carbon are employed.

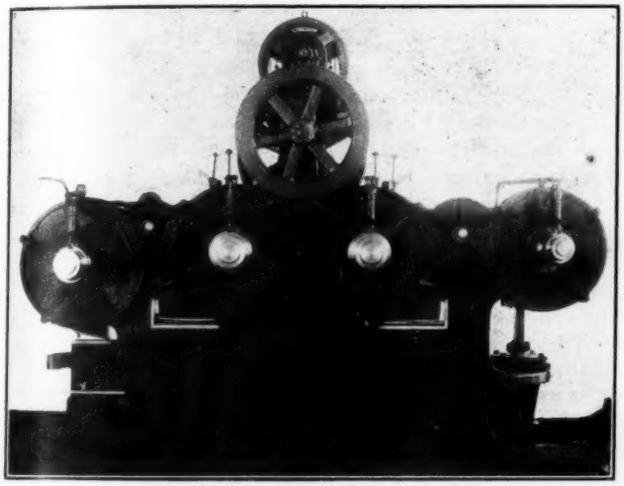


FIG. 1.—SHEAR FOR CHANNELS.

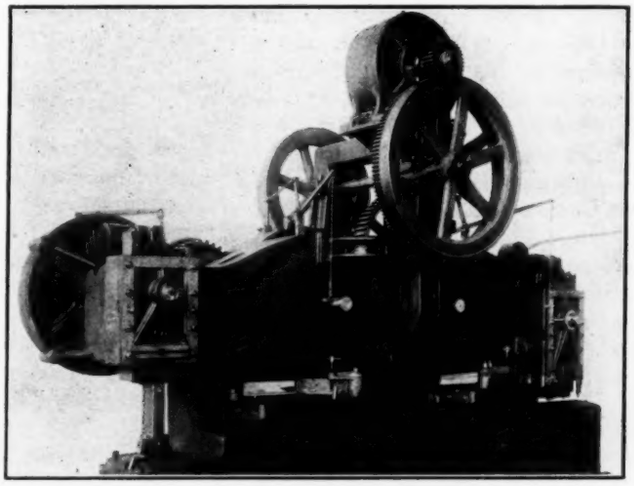


FIG. 2.—SHOWING POSITION OF MOTOR.

### Solder for Aluminum.

According to a French patent a good solder is composed of an alloy of one part tin and two parts zinc, to which five per cent of its weight of cadmium is added. These proportions are variable. The solder can be used without a flux.

### Krupp's Water-Tube Boiler.

Two designs of water-tube boilers fitted with superheaters, the invention of Fried. Krupp, shipbuilders, Kiel-Gaarden, Germany, are shown in Figs. 1 and 2. The design in Fig. 1 consists of an upper water drum, which communicates by two nests of tubes B with two lower water drums. Between the nests of tubes is located the furnace. Outside the nests of tubes B and on each side of the boiler is arranged a superheater E, in front of each of which is placed a damper G, which can be moved into a lower and an upper extreme position. Into the nests of tubes B are built fireclay guide walls for the heating gases, consisting of a longer portion F running longitudinally of the nest of tubes, and a shorter portion K lying at right angles to the nest. The walls K and the dampers G are so arranged with relation to each other that the dampers G, when in the lower position, form a continuation of the guide walls K for the heating gases. When the dampers G are in the lower extreme position shown in Fig. 1 the heating gases sweep first through only the small number of inner rows of tubes shut off by the guide walls F and over the short upper parts of the remaining rows

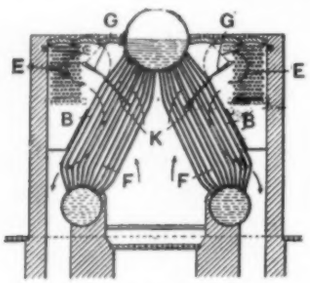



FIG. 1.—KRUPP'S WATER-TUBE BOILER.

of tubes. They then pass through the superheaters at still very high temperatures, and after that sweep through the remaining rows of tubes in the nest of tubes B. When the dampers G are in the upper position, however, the superheaters are shut off by the dampers, and the fire gases pass through the nest of tubes B only.

The difference between the boiler shown in Fig. 2 and the one above described is that two additional upper water drums are provided. These are likewise connected to the lower water drums by nests of tubes C, into which the guide walls M for the heating gases are built. The arrangement of the guide walls F K for the heating gases in the central nests of tubes B and of the dampers G accords with that of the boiler shown in Fig. 1. When the dampers G are in the lower extreme position shown in Fig. 2, the heating gases sweep first through the small number of rows of the nests of tubes B lying inside the walls F and over the short parts of the tubes lying above the walls K, pass next in a very highly-heated state into the superheat-

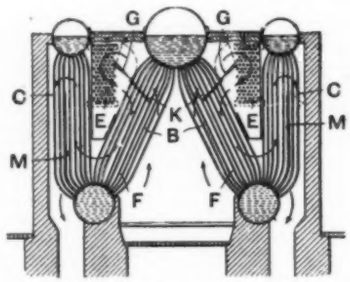



FIG. 2.—WATER-TUBE BOILER WITH ADDITIONAL WATER DRUMS.

ers E, then sweep through the remainder of the nests of tubes B, and after that pursue their way, guided by the guide walls M, through the nests C, to which they give up the rest of the heat which they contain. When the dampers G are in their upper extreme position, the superheaters are shut off, and the heating gases pass through the nests of tubes B C only.

### An Interesting Submarine Cable.

The Habirshaw Wire Company, New York, N. Y., has supplied to the New York Edison Company a cable which is to be laid under the Harlem River. There will be four lengths of 800 feet each. The cable contains three conductors of 350,000 circular mils, each consisting of 37 strands. Each conductor is insulated with a thirty-per-cent Para-rubber compound thirteen-sixty-fourths of an inch in thickness. This is taped, the three conductors laid up in cloverleaf form with fillers, taped and covered with eleven-sixteenth-inch jacket of rubber compound. All this is surrounded by another layer of tape, one-eighth-inch of lead, a jute bedding and armored with 38 galvanized No. 4 steel wires; the whole is covered with two layers of jute and tar. Each length of cable weighs about nine tons and is four inches in diameter. It is designed for 13,000 volts working pressure and was tested for one-half hour at 25,000 volts between conductors and from conductors to ground.

### New Multiple-Switch Starting Rheostat.

Multiple-switch starting rheostats differ from the ordinary type used for small motors in that the sliding contact is entirely eliminated and a series of individual switches, which cut out individual steps of resistance, is substituted. The Cutler-Hammer Manufacturing Company has redesigned its entire line of multiple-switch starters. In place of the lever closing upward, the present toggle-joint-operated switch is closed by means of handles placed below the switch contacts.

Because of the larger currents required by large motors, the sliding-contact starter is limited to small or moderate sizes. With the multiple-switch starters there is no sparking in starting the motor. The illustration is that of a 75-horsepower, 220-volt, new-type, multiple-switch starting rheostat. In starting the left-hand switch is closed first, then the second, third, etc., allowing a second or two between. Each switch, by means of metal stops near the handles, holds the switch before it in place. When the last switch is closed the no-voltage-release magnet holds them all in contact and the entire resistance is short-circuited. The switches cannot be closed out of order, and two or three switches, for instance, cannot be closed and the others left open. Releasing the hand from any handle except the last causes all switches to open. The motor cannot run with resistance in the circuit and the resistance is, therefore, also protected from overheating.

MULTIPLE-SWITCH STARTING RHEOSTAT.

### Panama Canal Motors.

A contract for trial motors for the miter gate-forcing machines to be used on the locks of the Panama Canal has been awarded the Allis-Chalmers Company.

### New Cable-Testing Instrument.

A very convenient instrument for cable testing has been brought out by Dieny & Lucas, of Paris. It is designed to localize a fault in an underground cable, and shows at once the distance in feet from the testing point to the fault, so that the position of the fault is known. The measurement can be made very quickly by means of the instrument shown in the accompanying illustration, and the diagram indicates the method employed. It can also be used for overhead lines, and in all cases

CABLE-TESTING INSTRUMENT.

it shows the point where a leak to ground occurs on the line. Such point is found by the drop of voltage method. Referring to the diagram, the cable in question is supposed to have a uniform section, as is generally the case, and the two far ends are connected together by a low-resistance coupler, taking care to have a good contact. The bottom part of the instrument contains a battery which supplies the current, or this can be obtained on the spot from other circuits. At JJ¹ are the terminals of the battery and two lines connect the battery and the cable at AB. From the points CD on the cable are taken off two wires which are connected through RR¹ to a voltmeter circuit in order to make the measurement. A first reading is taken without connecting the voltmeter to ground, so as to indicate the voltage between C and D. Then a second voltage reading is taken when the voltmeter is connected to ground, and a comparison of the two shows the position of the fault. In order to make the reading directly in feet, the following method is used.

A wire is run from binding post S to ground or to the lead covering of the cable. The voltmeter coil is in series with a set of resistances K and a sliding resistance W. The switch U can be thrown so as to connect one end of the voltmeter to the cable F or to ground G. At first the voltmeter switch connects to the cable UF. Supposing the cables have 400-foot length each, or a total of 800 feet between C and D, the resistances are adjusted un-

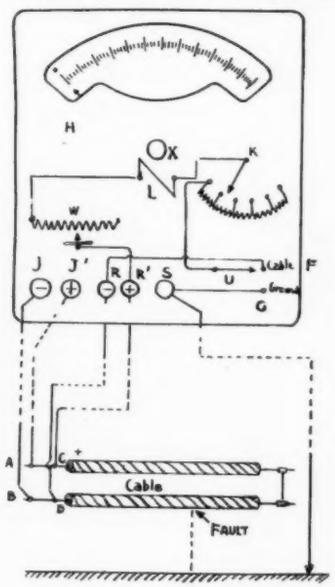


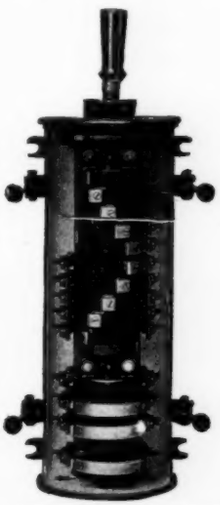

DIAGRAM OF CONNECTIONS.

til the voltmeter needle points to the corresponding figure or 800. The fixed resistances K are first used, then the sliding resistance W for this purpose. The switch U is then thrown over to the ground connection G and the voltmeter now gives another reading and the needle points say to 600. This indicates that the fault lies at 600 feet from the point C, so that its position is known very closely. In order to check up the result, the current is reversed by reversing the connections for the battery current and those of the voltmeter at the same time, and the reading now obtained will show the distance of the fault from the point D. Should current be available on the spot, the lower part of the box containing the battery can be detached and the upper part is used alone.

### Drum Controller for Slip-Ring Motors.

The importance of the easy replacement of wearing parts of a controller has been recognized by the Independent Electric Manufacturing Company, of Milwaukee, Wis., and the alternating-current, slip-ring-type drum controller which is here illustrated is a good example of that company's modern scheme of design. This controller is designed for printing-press motors, hoists, cranes or other places where a reliable, close speed regulation is required, and where the increasing use of alternating current for power work requires the employment of the induction motor as a means of drive.

The controller is strongly made, the hard-drawn copper segments being fastened by screws to a cast-iron drum.



DRUM CONTROLLER FOR SLIP-RING MOTORS.

Like the segments the contact fingers are removable and may be replaced at a slight cost. Thus the design has been made with especial attention to replacement, and those parts which are apt to wear may be replaced with a minimum amount of labor, and at a cost which is very small indeed.

A standard of sixty per cent below normal speed has been adopted, although in cases where a controller capable of causing a greater or less drop of speed in the motor is desired, these requirements can be easily met.

Type A, shown in the illustration, is made in sizes from two to five horsepower.

### Automatic Controllers for Motor-Driven Machinery.

The Electric Controller & Manufacturing Company, of Cleveland, O., has recently placed on the market a line of automatic controllers designed for the specific purpose of giving the utmost convenience in the control of motor-driven machinery. It has been estimated that the output of many machines can be increased twenty per cent by the central grouping and convenient arrangement of all the operating levers. "Handiness of control" is recognized as being very important in securing the utmost production from a machine, and the automatic controllers described in this article were designed to provide this "handiness of control" for starting, stopping, or reversing the motor and machine.

FIG. 1.—OPERATOR'S SWITCH.

The controllers are built in three types to secure: (1) non-reversing and dynamic braking; (2) reversing without dynamic braking; (3) reversing and dynamic braking. In each type a variety of four different forms of accelerating units are offered. These accelerating units vary in their design from a simple train of accelerating switches up to a unit having a fused service switch, a train of accelerating switches, and complete circuit-breaker features.

FIG. 2. AND 3.—ACCELERATING UNITS FOR TWO TYPES OF CONTROLLER.

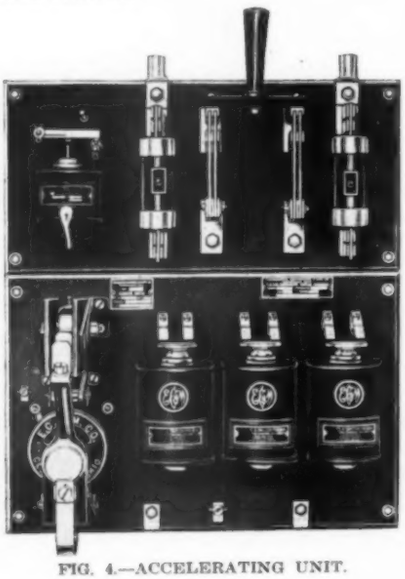


FIG. 4.—ACCELERATING UNIT.

The controller consists of a small operator's switch, shown in Fig. 1, and an accelerating unit, four different forms of which are shown in Figs. 2, 3, 4 and 5.

The accelerating unit automatically accelerates or decelerates the motor through the action of series-wound accelerating switches which possess the remarkable characteristic of acting, not only as switches, but as current-limit relays as well. When the current in the winding of one of these switches exceeds a pre-determined value the switch locks open and cannot close until the current is reduced to the proper value.

When the operator's switch is thrown to the running position, current flows through the motor, all of the starting resistance, and the coil of the first series-wound accelerating switch. As the motor accelerates, the current drops, and when it reaches the correct value the first accelerating switch closes, cutting out a portion of the starting resistance. The succeeding accelerating switches operate similarly, ultimately cutting out all of the starting resistance and putting the motor across the line. By throwing the operator's switch to its original position, the motor is disconnected from the line and consequently stops. Different positions of the handle of the different types of operator's switch provide for drifting, reversing, or rapid stopping by dynamic braking.

Dynamic braking is secured by a change of connections, accomplished by the operator's switch, which first inserts all the starting resistance in series with the armature. The motor is then quickly and evenly brought to rest by automatic dynamic braking, the accelerating switches, in this case, acting as decelerating switches by cutting out, step by step, the resistance as the current, generated by the motor, decreases due to the slowing down of the motor.

FIG. 5.—ANOTHER TYPE OF UNIT.

The manufacturers claim the following important advantages for this automatic controller:

(1) It limits the acceleration and deceleration current at all times to a safe value.

(2) It accelerates and decelerates the motor in the minimum safe amount of time, and automatically varies the time of acceleration and deceleration, depending upon the load which the motor has to start and stop.

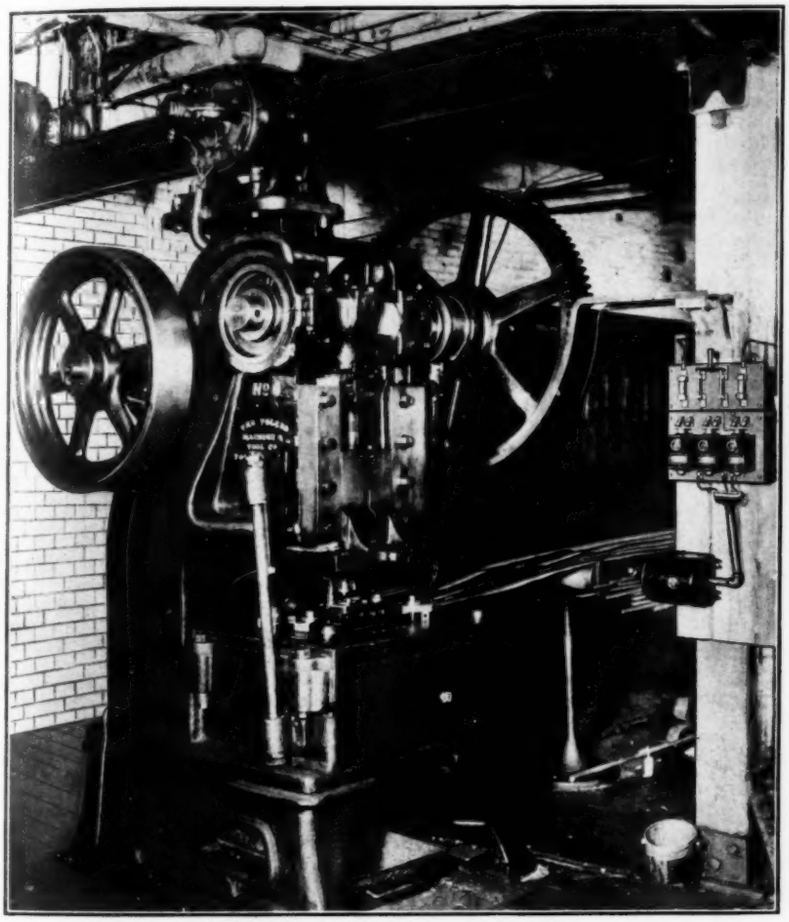


FIG. 6.—APPLICATION OF CONTROLLER TO PUNCH PRESS.

(3) It provides the best conditions for good commutation.

(4) By limiting the current, both in starting and stopping, it limits all mechanical strains on the motor and driven machinery.

(5) It obviates the necessity of mechanical clutches on many motor-driven machine tools.

(6) It adds very materially to the safety of an installation, since in case of accident the motor may be quickly stopped.

(7) It inherently provides no-voltage protection, for if the voltage fails the switches drop open, and upon the return of voltage they automatically close in their regular method and sequence, again accelerating the motor to full speed.

Fig. 6 shows the application of one of these controllers to a punch press.

### Allis-Chalmers Pumps Exceed Efficiency Guarantee.

The electrically-driven pumps in the new water works at Niagara Falls, N. Y., were guaranteed by their makers, the Allis-Chalmers Company, to have an efficiency of 54 per cent. Actual tests have demonstrated an efficiency of 67 per cent.

### Central of Georgia to Dispatch By Telephone.

The Central of Georgia is another of the large railroad systems in the South to equip its lines with telephones for train dispatching, and to this end has placed an order with the Western Electric Company for equipment, including complete line-construction material. The line to be equipped extends from Columbus, Ga., to Birmingham, Ala., and is 160 miles in length. Along this line there will be located thirty-one way stations and fourteen siding sets, in addition to several telephone sets in the chief dispatcher's office.

### Federal Fixture Straightener.

The Federal fixture straightener is a device which has been designed to save time and trouble in getting fixtures to hang plumb. Few outlets in ceilings are straight, and although the slight angle may be too small to be noticed at the time the installation is made, it will often cause a fixture to hang several inches out of plumb. There is often difficulty and waste of time in remedying such a condition and sometimes threads are broken and boxes loosened in the attempt.

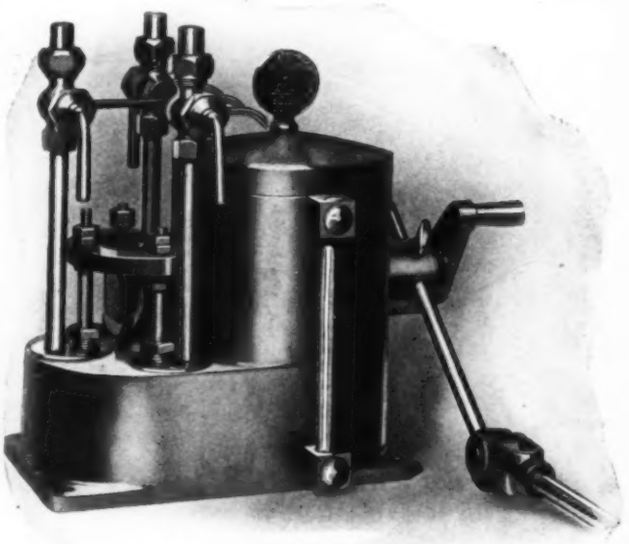
FIXTURE STRAIGHTENERS.

The fixture straightener consists of a ball and socket joint as shown in the accompanying illustrations. It can be tightened or loosened by turning the unit which contains the socket. It is made of malleable iron, in two styles;

one with a stud for attaching to any standard outlet box by the screws, and the other with a threaded sleeve for three-eighths-inch studs for gas piping. By its use fixtures may be fastened to sloping ceilings, rafters or any other places where an adjustment is difficult. The fixture may be easily placed in a vertical position and be easily and quickly tightened, after which it cannot work loose. This device is manufactured by the Federal Sign System (Electric), of Chicago, Ill.

### The Improved Sterling Mechanical Lubricator.

The Sterling Machine Company, Norwich, Conn., is the manufacturer of a mechanical lubricator for which a number of points of superiority are claimed. The Sterling oil pumps can deliver their discharge against any pressure or vacuum met with in operation, and are not affected by temperature, viscosity of oil, or length of pipe. The reservoir has a large diameter for filling. The plunger stroke can be regulated, the lever length adjusted, or additional oil pumped by hand while the lubricator is in operation. Every part is made of steel. These lubricators may be applied to any type of steam engine, pump, air compressor, single-acting gas engine, or any other machinery requiring oil to be fed under pressure.



THE STERLING LUBRICATOR.

A three-feed Sterling lubricator is shown in the accompanying illustration. A substantial tank is provided, through which is cast a hollow hub containing the main operating shaft. This is driven by a connecting rod attached to some reciprocating part of the unit to be lubricated. The amount of rocking motion can be varied by a simple adjustment with wing nut. The hub drives, by means of pawls, a ratchet pinned to the main shaft. This carries at one end a strong hand crank and at the other end a broad-faced cam operating a yoke. This yoke has a large hollow shank working in a reamed hole in the main casting. The hollow shank is filled with oil and contains a felt wick for lubricating the cam. As it rises and falls the yoke carries with it the pumping plungers.

The parts may be easily removed for inspection. The whole forms a rugged and simple construction which can be quickly taken apart and reassembled. The valves of the pump are of the steel-ball type, which has proven most durable and safe. Each pump has two suction valves and four delivery valves.

### The Thyssen-Pfleiderer Rotary Air Pump.

The fact that the steam turbine can utilize effectively steam at a very low pressure, has led to much attention being paid to the subject of improving vacua. The most obvious step to be taken is naturally to reduce to a minimum the air leakage into the condenser, but at the same time much has been done in improving methods of abstracting what air there is from the condenser. Vacua of 29 inches with the barometer at 30 inches are now by no means unusual during the winter months. With an absolute pressure equivalent to but one inch of mercury even a small weight of air occupies a large volume. This, and the fact that large volumes of any fluid are commonly more conveniently handled by rotary than reciprocating mechanism, has led to a revival of the use of rotary air pumps, first tried with reciprocating engines many years ago, but abandoned, since an ordinary reciprocating air pump easily gave as good a vacuum as was then considered desirable. In the conditions which now rule in power-station practice, the reintroduction of the rotary air pump has proved in every way satisfactory. It can be very conveniently run by means of an electric motor, while with an air pump of the ordinary type this is only possible by the use of reduction gearing.

A form of this type of pump manufactured by the Maschinenfabrik Thyssen Allermeingesellschaft, of Mülheim-Ruhr, Germany, possesses certain special characteristics. All such pumps are essentially modifications of the well known ejector or jet pump. In the Thyssen pump each of the two jets is an annulus, which receives the water supplied by the impeller of a centrifugal pump of the ordinary type, and discharges this water through "combining cones." In passing through these combining cones the water draws in by induction the vapor and air in a space which is in direct communication with the condenser, and discharges through an inclined pipe. The water supply to the pump flows both ways to the impeller, so that the impeller thrust is completely balanced. The special feature of the pump lies in the fact that the discharge area through one of the annular jets is adjustable from the exterior, by means of a hand wheel. The makers claim that an eddying motion is set up in the escaping water which causes the issuing jet to break up into a state in which it can abstract a maximum of air. It is further claimed that the relative motion of the opposing walls breaks up any foreign solid body, such as lumps of mud or wood, which might by accident lodge in the narrow passageway. The impeller spindle runs on ball bearings.

One of these pumps was recently opened up after running day and night for nine months, and there was found to be an entire absence of wear, either in the cones or on the surfaces of the impeller or guide-blade chambers, the bronze of which, in fact, was found to be covered with a fine patina, under which the original tool marks were plainly visible. The amount of steam entering the condenser at full load was 66,000 pounds per hour, and the vacuum was readily maintained at over 99 per cent of that corresponding to the temperature of the cooling water.

# Current Electrical News

## COMMISSION NEWS FROM NEW YORK.

*(Special Correspondence.)*

The Court of Appeals has decided that the reorganization plan of the Third Avenue Railroad Company of New York need not be approved by the Public Service Commission. Under the plan new securities amounting to $54,916,000 were to be issued to take the place of $70,028,800 old securities. The Public Service Commission denied permission to issue the new securities on the ground that the capitalization proposed was not justified by the value of the property. The Court of Appeals, affirming a decision of the Appellate Division, declared that the reorganization did not concern the Public Service Commission as long as the securities proposed to be issued did not exceed the face value of the securities already in existence.

In a summary of ticket sales on the elevated lines in Manhattan and the Bronx, operated by the Interborough Rapid Transit Company, for the year ended June 30, 1911, which were made public by the Public Service Commission it is shown that the sales on all lines, namely the Second Avenue, the Third Avenue, the Sixth Avenue and the Ninth Avenue elevated roads, were 301,449,292. This was an increase of 7,623, 12 over the preceding year. The largest increase reported at any one station was at the Thirty-third Street station of the Sixth Avenue line, where the sales were 1,066,008 more than the preceding year.

A new point with regard to the effect of state regulation of public utilities has been raised by the New York Edison Company in relation to the competition that it appears it will now have to face from the Long Acre Electric Light & Power Company. It contends that since in its service and rates it is obliged to submit to the regulations laid down by the Public Service Commission, it is the duty of that commission to protect it against competition. This has been raised by a writ of certiorari issued by Justice Seabury, which has served on the commission, and directs a court review of its approval of the issuance by the Long Acre Company of certain stocks and bonds. This corporation has a franchise for the supplying of electricity in Manhattan, and has erected a plant in the borough.

At first it asked for permission to issue $50,000,000 bonds and $10,000,000 stock, but this was refused. The company appealed to the Appellate Division and obtained a decision ordering the Commission to authorize the issue of securities to a reasonable amount. In obedience to that ruling the Commission granted the right to issue $2,000,000 in stocks and $4,000,000 in bonds. The New York Edison Company is now attacking this order on the ground that it would work unfairly toward it.

The Public Service Commission, Second District, has received an application from the Lewiston & Lake Ontario Shore Power Company for permission to exercise franchises in the villages of Lewiston and Youngstown and the towns of Porter and Lewiston, and for permission to begin construction of its plant and system for transforming and distributing electricity for light, heat and power. The applicant company purposes to purchase electricity for sale for light, heat and power throughout the towns of Lewiston, Porter and Wilson, Niagara County, from the Niagara, Lockport & Ontario Power Company, and asks the Commission to authorize the sale of $25,000 of stock, the proceeds to be used to acquire the necessary real and personal property for right of way, distribution system, transformer stations and equipment. Substations will be located in Lewiston, Youngstown and Ransomville.

The Commission has received a complaint from George Duchscherer, proprietor of the Hotel Touraine in Buffalo, alleging that the New York Telephone Company has refused to connect its trunk lines operated in connection with a switchboard of that company in one building of the hotel, with the lines of the Federal Telephone & Telegraph Company at its switchboard in another building, in order to enable the Hotel to give its patrons service over the lines of both companies from the single instrument in their rooms. The complaint has been served upon the company and an answer required within twenty days.

## INTERSTATE COMMERCE COMMISSION NEWS.

*(Special Correspondence.)*

The Interstate Commerce Commission has dismissed the complaint brought by the Goodman Manufacturing Company against the Chicago, Burlington & Quincy Railroad Company, et al., as to the reasonableness of a rate assessed on two cars of electrical mining machinery, the first car containing 23,000 and the second 13,000 pounds. It was claimed by the shippers that this was one shipment, and they sought to have it treated as such; however, it was separated, not because it could not have been loaded on one car, but because the shipper felt that it would be safer moving in the two cars and it also appears that two bills of lading were issued. Under the rule of the carrier the shipment can only be considered as one when it is moved in two cars if it is covered by one bill of lading; and in this instance the error to so ship was entirely the fault of tne complainant.

## IMPORTANT DEVELOPMENTS.

*(Special Correspondence.)*

AU SABLE DAM NEAR COMPLETION.—It is expected that power will be transmitted over the cable line between Flint, Mich., and the power dam on the Au Sable River by January 1. The plant is located about thirteen miles northwest of the village of Au Sable. When the present work is completed Flint will be a link of a chain of central and southern Michigan cities supplied by a series of water and steam-power plants, of which fourteen are water power and seven steam, with a combined output of 92,000 horsepower. The power that will be at the command of Flint after January 1, 1912, will be 15.3 times the amount needed to supply the present wants of the city. Power will be transmitted at 140,000 volts.

NEW MEXICAN PLANT PLANNED.—H. B. Johnson and R. H. Bouldare, of Silver City, N. M., are promoting the installation of a large hydroelectric plant on the Gila River, sixty-five miles north of Deming, N. M., and the construction of power-transmission lines to Deming and through the Mimbres Valley to furnish power for irrigating pumping plants and other industries. The power site is on the east work of the Gila, and the drainage above amounts to 3,176 square miles. The first development dam will be a fifteen-foot timber dam; the power diversion dam will be a thirty-foot dam where the flow is 100 second-feet without any storage. The whole project will require something like $1,200,000, and the time required to complete it will be between two and a half and three years. The first development contemplated will rquire from $300,000 to $350,000. The power field is said to be an excellent one. D.

## LIGHTING AND POWER.

*(Special Correspondence.)*

COLFAX, WASH.—A street lighting system is to be installed here.

MENLO, IOWA.—The city will vote on granting a franchise for electric lighting. C.

WINNER, S. D.—B. M. Martin, of Dallas, has asked for an electric light franchise.

PARSONS, KANS.—Frank Workman has been granted an electric light franchise here.

GALVA, IOWA.—This city is about to vote on bonds for $8,500 for an electric light plant.

RIVERSIDE, CAL.—The city is building an electrolier lighting system in the residence section. A.

SAN JOSE, CAL.—The Great Western Power Company has been given a franchise in this city.

CORNING, IOWA.—The city granted a franchise to the Corning Light, Heat & Power Company. C.

SHULLBURG, WIS.—This village has voted to grant a franchise to the Interstate Power Company.

DORRIS, CAL.—The Siskiyou Electric Light & Power Company has been given a franchise in this town.

MT. VERNON, IOWA.—W. S. Trasker has been granted a franchise for installing an electric light plant. C.

WOONSOCKET, S. D.—The Schuler Electric Company is asking for a franchise for an electric light plant.

NORFOLK, NEB.—The city will vote December 12 on $75,000 bonds for an electric light and water system. C.

ALLISON, IOWA.—The town will vote, December 11, on granting an electric light franchise to Claude Mackey. C.

WATERFORD, WIS.—The Waterford Electric Company has been incorporated with a capital stock of $20,000.

EDMONTON, ALTA.—The City Commissioners will consider extending and improving the electric lighting system. C.

MUSKOGEE, OKLA.—The Tahlequah Gas & Power Company has been incorporated with a capital stock of $25,000.

LETHBRIDGE, ALTA.—On December 11 the city will vote on $450,000 for a municipal street railway and power plant. C.

DEVILS LAKE, N. D.—The proposition carried on issuing bonds for the purpose of erecting a municipal electric light plant. C.

LAKE CRYSTAL, MINN.—The Consumers' Power Company

will run a line here, from the dam, five miles east of here, providing the Council will grant them a franchise. C.

WAGONER, OKLA.—The Wagoner Electric & Gas Supply Company has been incorporated with a capital stock of $1,500.

WAREHAM, MASS.—Funds have been voted for the extension of the electric lighting system from South Wareham to Tremont.

BLANCHARD, IOWA.—A. L. Johnson contemplates installing an artificial ice plant in connection with an electric lighting plant. C.

KEARNEY, NEB.—A vote will be taken on issuing bonds for $40,000 for the installation and operation of a municipal lighting system. C.

HUNTER, N. D.—Thackery & Lightwood, of Moorhead, Minn., have started work on installing electric generators and wiring for the city. C.

WANATCHEE, WASH.—The Wanatchee Valley Gas & Electric Company has purchased the plant of the Valley Power Company at Dryden.

PACHUCA, MEX.—The Real del Monte Mining Company plans to increase the capacity of its electric power plant at the Difficultad mine. A.

SANTA RITA, N. M.—The Chino Copper Company has commenced the erection of a central electric power plant at its mining properties. A.

ELY, NEV.—E. K. Hutchinson and C. F. Rose, of Ely, plan for the erection of an electric lighting plant with a distributing system at Ely and vicinity. A.

FOLEY, MINN.—The Battery Company, of Milwaukee, Wis., has been granted an electric light franchise. Otto Jensen will be the local manager.

CASTLE ROCK, WASH.—H. B. Davis, J. W. Selden and the Tahama Investment Company have been granted an electric light franchise in this town.

TRACY CITY, TENN.—An electric light plant and water works is being installed here. The city has been without both electric lights and adequate water supply.

ABERDEEN, WASH.—The city plans for the installation of new arc lights and tungsten street lighting system. Power is furnished by the Grays Harbor Railway & Light Company. A.

CENTRALIA, WASH.—The Washington Union Coal Company is having plans prepared for an electric light and power plant at its mines, near Mono. The plant is estimated to cost $250,000. A.

MINNEAPOLIS, MINN.—The City Council is considering the installing of an electric generating plant in connection with the new water filtration plant, which is now in course of construction. C.

EAU CLAIRE, WIS.—There is an agitation for the rebuilding of the Dell Dam which furnishes power for the Chippewa Valley Railway, Light & Power Company, and the Dell Paper & Pulp Company. C.

EUREKA, CAL.—After some delay, the Blue Lake lighting system, owned by the Minor Mill & Lumber Company, has been formally purchased and taken over by the Western States Gas & Electric Company.

HORSESHOE BEND, IDAHO.—The Pacific Power & Light Company plans for the construction of a power line from Horseshoe Bend to Wahkiacus Heights, from its power plant on the Little Klickitat River. A.

WILMINGTON, DEL.—An ornamental lighting system is to be put in here on Market Street and the lighting circuits to be placed underground. This latter work will be done immediately after the Christmas holidays.

CUTTER, N. M.—The Vanadium Mines Company plans for the erection of a new electric power plant near Cutter. W. A. Bonitz, Pittsburg, Pa., is head of the company. About $20,000 will be expended for the plant. A.

FRESNO, CAL.—The Pacific Light & Power Corporation has secured a fifty-year franchise for a transmission line in Fresno County, and has also been given a franchise to extend its lines through Tulare County.

PHOENIX, ARIZ.—The Iowa Falls Heat, Light & Power Company, of Iowa Falls and Des Moines, Iowa, has filed articles of incorporation here, with a capital of $150,000. O. F. Peterson and J. H. Girdey are incorporators. A.

LOS ANGELES, CAL.—The Hoagland Electric Company has been incorporated with a capital of $1,000,000, by H. A. Hoagland, J. N. Kelman, of the Kelman Electric & Manufacturing Company, Los Angeles, and John M. Marshall. A.

STANFORD UNIVERSITY, CAL.—Frank M. Gardner & Company, San Francisco, has been awarded a contract by the Board of Trustees of the Leland Stanford Junior University at $14,000 for the erection of a power plant on the college campus. Plans were prepared by W. F. Durand. A.

ATTALIA, WASH.—The Pacific Power & Light Company has signed a contract to furnish electric power to the Attalia Land Company, for pumping operations. The company has commenced the erection of a transformer station. A.

TUCSON, ARIZ.—The Powmott Development Company plans for the erection of a hydroelectric power plant near Silverton, with a transmission system to its mining properties, a distance of fifteen miles. William McDermott is manager. A.

RINGOLD, WASH.—The Pacific Power & Light Company plans for the construction of a transmission line to the Ringold Bar district, where the company has been awarded a contract for furnishing electric power for pumping operations. A.

SAN BERNARDINO, CAL.—The Southern Sierras Power Company has awarded to M. H. French the contract for the first distributing line of the company to be run from this city to Riverside, Perris and Elsinore. A side line will be run from Riverside to Corona.

PHOENIX, ARIZ.—The Tracy Engineering Company plans for the erection of a hydroelectric power plant on the Colorado River. The company has been granted a franchise in Mohave County, by the Board of Supervisors, for the construction of a transmission line to Kingman and vicinity. A.

PORTOLA, CAL.—The Reno Mill & Lumber Company recently secured the water rights and franchise of the Portola Light & Power Company and is now building a large dam on Grizzly Creek to furnish power for the generation of electricity to be used for lighting the town of Portola.

RENO, NEV.—The Nevada Valley Power Company has been incorporated at Reno for $2,500,000. A. D. Ayers, H. B. Danforth and A. A. Smith, of Reno, Milton S. Hamilton and F. J. Early, of Oakland, are the incorporators. A power plant will be built on the Truckee River, east of Reno.

HARTFORD CITY, IND.—The Mayor and City Council are preparing to remodel and install new machinery in the local waterworks and electric plant or build and equip a new and model plant outright. They are now inspecting plants in other cities with a view of making a decision. S.

SHEBOYGAN, WIS.—The K. Schreier Brewing Company is to install additional electrical equipment at its brewery so that the capacity will be practically doubled. The new machinery will include a 450-horsepower Corliss engine-generator set for power supply, and a thirty-horsepower generator for lighting.

HOOD RIVER, ORE.—The Hydro-Electrical Company has been awarded a ten-year lighting contract at Hood River by the City Council. The rate, it is said, is fifty per cent less than that now charged by the Pacific Power & Light Company. The grantee is building a hydroelectric power plant on the Hood River. A.

BEATRICE, NEB.—A new electric light corporation has been formed of which the Beatrice Electric Company will be a part. Plants will be operated in Nebraska, Iowa and South Dakota. The new corporation will be known as the Nebraska-Iowa Public Service Company. E. A. Bullock, of Omaha, is president, and Clyde Bullock, of Norfold, is secretary. C.

KEOKUK, IOWA.—Work has started on a transmission line, 167 miles long, which is to carry power from Hamilton, Ill., to St. Louis. The work is being done under the direction of the Stone & Webster Engineering Corporation, Boston, and will cost $2,000,000. The development of the water power itself and its attendant electric generating equipment will cost $25,000,000. C.

VIRGINIA CITY, NEV.—The Truckee River General Electric Company has been granted a franchise for the construction of a transmission line in Storey County by the Board of County Commissioners. Under the terms of the grant the County will receive the present lighting system at Virginia City, with the privilege of purchasing electrical energy at a uniform flat rate. A.

PUEBLO, COLO.—Incorporation articles of the Arkansas Valley Railway, Light & Power Company, with headquarters at Pueblo, have been filed in Denver. The company has a capital stock of $10,000,000, and the incorporators are W. F. Raber, T. H. Devine and F. W. Insull. The articles of incorporation are also registered in Teller, El Paso, Fremont, Pueblo and Otero Counties, where the company will operate its extensive holdings. An interurban electric railway line connecting Pueblo with the adjacent rich fruit and agricultural districts will be constructed by the company, but not within a year.

SAN BERNARDINO, CAL.—The Southern Sierra Power Company has completed arrangements for the construction of a hydroelectric power plant in the Sierra Nevada Mountains, Kern County, Cal. The plant is estimated to cost $1,600,000 and will be operated in conjunction with the company's system in San Bernardino and Riverside Counties, now building. The company has awarded a contract to M. H. French for the construction of a transmission system to Riverside, Perris and vicinity, a distance of about seventy miles, at a cost of $159 per mile.

GREELEY, COLO.—Surveys have been made of the route for bringing electric power to Greeley from the plant in Poudre Canon for use of the Greeley Hydro-Electric Company. The line will be about eighty miles long, running in practically a straight line to Greeley after it leaves Boulder Canon, and will cost about $72,000. Enlargement of the present plant to one of 5,000 horsepower will soon begin, and within two months is expected to begin laying pipe lines to utilize the Laramie River flow. There is a constant flow in the Poudre and Laramie Rivers sufficient to work the plant at full capacity the year around.

## ELECTRIC RAILWAYS.

*(Special Correspondence.)*

SOUTH BEND, WASH.—Work will be rushed on a trolley line from this city to Raymond. C.

EDMONDS, WASH.—Efforts will be made to secure a street car line to connect this city with the interurban to Seattle. C.

WILLOWS, CAL.—The Sacramento Valley West Side Electric Railway has applied for a franchise through Glenn County.

PHOENIX, ARIZ.—The Salt River Electric Railway Company has been granted a twenty-five year franchise in this city.

TWIN FALLS, IDAHO.—The Twin Falls, Artesia City & Oakley Interurban Railway Company has been incorporated with a capital stock of $500,000.

MEDFORD, ORE.—J. Arnold Doyle and H. M. Farren, organizers of the Oregon Southern Railway Company, have applied for a franchise in the town of Medford.

RIVERSIDE, CAL.—The City Council has accepted the offer of $25,000 by the Pacific Electric Railway Company for a franchise for a double track line on the extension of Magnolia Avenue.

SAN JOSE, CAL.—The San Jose Terminal Railroad Company has been granted franchises on the principal streets of Alviso. The company plans to build an interurban road connecting San Jose and Alviso.

NASHVILLE, TEX.—According to a report current here, New York interests have purchased a controlling interest in the Piedmont Carolina Railway Company and an interurban between Concord and Salisbury is proposed.

REDLANDS, CAL.—It is announced that the Pacific Electric Company will soon extend the Redland Central line on Brookside Avenue to Redlands Junction, giving electric connection with the Southern Pacific overland trains.

LOS ANGELES, CAL.—The Pacific Electric Railway Company has a force at work rebuilding the Sixteenth Street line to Rosedale Cemetery. Only three miles remain to be built which will complete the beach lines to the west coast.

CRESWELL, ORE.—The Eugene Belt Line & Interurban Railway, recently incorporated with headquarters at Eugene, Ore., plans for the construction of an electric railway at Creswell, where a bonus of $25,000 has been raised by citizens. A.

DES MOINES, IOWA.—The Perry Electric Railway Company has been incorporated with a capital of $100,000. The incorporators are B. C. Dilenbeck, J. E. Hambright, Charles E. Wilson, C. C. McCrerry, H. C. Modlin, J. E. Wilson and H. G. Giddings.

SAN FRANCISCO, CAL.—The Napa Valley line has been reorganized and incorporated as the San Francisco, Napa & Calistoga Railway, with capital stock of $2,000,000. The incorporators are Alfred Sutro, T. V. Maxwell, Charles C. Sullivan, Guy C. Earl and W. H. Spaulding.

PASADENA, CAL.—This city is laying plans to acquire a municipal street car system. It has been decided that all future street railway franchises granted by the city will stipulate that upon expiration of the franchise all tracks, poles and trolley wires will revert to the city.

BELLE FOURCHE, S. D.—Articles of incorporation have been filed for the Belle Fourche & Spearfish Electric Railway Company, which has a capital of $5,000. The incorporators are: A. A. Moodie, Bruce Sebastian, Fred E. Harris and F. E. Duba. The electric line will be built from here to Spearfish, a distance of fifteen miles.

SAN BENITO, TEX.—Plans have been adopted for the extension of the interurban line of the San Benito & Rio Grande Railway Company to Santa Maria. This extension will be finished by the first of the coming year, it is stated. Other extensions are planned for next year. Sam Robertson, engineer and contractor, is at the head of the company. D.

MISSION, TEX.—The Business Men's League of Mission has accepted a proposition of the San Benito & Rio Grande Interurban Railway Company for the construction of an extension of its line to this place and Monte Christo. It is announced in this connection that it is the purpose ultimately to make San Antonio the northern terminus of the system. D.

CINCINNATI, O.—Through the Cleveland Trust Company, William E. Hutton, of this city, has purchased nearly a third of a million dollars of the stock of the Cincinnati, Dayton & Toledo Traction Company. A portion of the line is in operation under a lease to the Ohio Electric Company. Hutton is also a director of the Toledo Railways & Light Company. H.

ROCHESTER, MINN.—Work has been started on the construction of the new interurban line through Cannon Falls to this city, and it is the intention to run another line from a point south of Hastings through Miesville and Welch to Red Wing, providing the right of way is given. Senator A. B. Stebbins, of Rochester, Minn., is president, and B. F. Seager, of Cannon Falls, Minn., is a director. C.

GREENVILLE, TEX.—It is announced by A. Ralph Nicholson who is promoting the construction of an interurban electric railway between Blue Ridge and Gainesville via Greenville that the plans for the project are well advanced. It is expected that construction work will be started about January 1 and that within six months after that time the line will be finished between Greenville and Blue Ridge. The line will be about seventy-five miles long.

GREENFIELD, MASS.—The Massachusetts Northern Railways Company has taken over a large majority of the common capital stock of the Connecticut Valley, Athol & Orange and Gardner, Westminster & Fitchburg Street Railways and all the debts and substantially all the stock of the Templeton Street Railway. It is contemplated by the new company to construct lines connecting Millers' Falls and Orange and an extension from Baldwinsville to Winchendon.

## TELEPHONE AND TELEGRAPH.

*(Special Correspondence.)*

TOWNER, N. D.—The telephone company is making extensive improvements on its plant. C.

KINGSTON, WIS.—The Union Telephone Company has been incorporated with a capital stock of $5,000.

TROY, IDAHO.—The Nora Farmers' Rural Telephone Company has been organized by A. F. Weeks and others.

UNDERWOOD, N. D.—The McLean County Farmers' Telephone Association has been granted a local franchise. C.

HOPE, IDAHO.—An ordinance has been passed granting the Pacific Telephone Company a franchise to operate a telephone system here.

GARDNERVILLE, NEV.—A co-operative telephone company owned and operated by residents of this section has been organized in Carson Valley.

LITCHFIELD, MINN.—G. E. Cassady, Route No. 2, is working to secure a telephone line for the territory north of Darwin and Dassell and east of Litchfield. C.

BERCLAIR, TEX.—J. C. Cameron has purchased the local telephone exchange from O. L. Kemp. The new manager is Horace Greathouse. Improvements will be made to the property. D.

COLLEGE SPRINGS, IOWA.—The College Springs Mutual Telephone Company has incorporated with a capital stock of $10,000. The incorporators are J. W. Gibson, Ira Mitchell and A. M. Finley.

COLVILLE, WASH.—The Board of County Commissioners has granted to the North Basin Telephone Company a fifty-year franchise to operate a telephone line out of Colville to that district.

OAKLAND, CAL.—The Business Men's Association of Walnut Creek will organize a telephone company and extend its lines to all towns and country houses in that part of Contra Costa County.

CHEYENNE, WYO.—The Mountain States Telephone & Telegraph Company has purchased the Kemmerer & Big Piney Telephone Company, operating 625 miles of wire in the western portion of Wyoming.

BELFIELD, N. D.—The North Dakota Independent Telephone Company has bought the local exchange of the Belfield & Northwestern Telephone Company. In the spring extensive improvements will be made. C.

FULTON, MO.—A new franchise has been granted to the Buffum Telephone Company, which operates the system here, and it is announced that work will start on a new $40,000 plant. J. C. Thornton is manager.

McKINNEY, TEX.—The Union Telephone Company has filed its charter in the Secretary of State's office at Austin. It has a capital stock of $75,000. The incorporators are C. B. Dorchester, C. A. Shock and H. W. Head.

NORTH BRANCH, MINN.—The farmers southwest of here have organized a new telephone line under the name of the Ideal Telephone Company. John Waldhoff is president and Theodore Thompson, secretary and treasurer. C.

TULETA, TEX.—The Tuleta Rural Telephone Company contemplates extending its system. At the recent annual meeting of its stockholders, reports were read showing that the property is in good condition and that its lines were considerably extended during the year. D.

MINERAL CITY, TEX.—The Mineral City Rural Telephone Company has been organized here. It will construct a system of lines in Bee County. The officers are: William Rommel, president; H. C. Schrock, vice-president; C. C. Schrock, secretary-treasurer; H. C. Schrock, W. Teuscher and R. C. M. Nelson, executive committee. D.

OGDEN, UTAH.—The Mountain States Telephone & Telegraph Company has commenced work on making physical connection between its system and that of the Independent Telephone Company, recently acquired. The company plans for many improvements in its exchange on Washington Avenue. W. F. Madson is local manager. A.

OWENSBORO, KY.—The firm of Russell Brewster, of Chicago, has purchased the controlling interest in the Rural Home Telephone Company in Daviess, McLean, Hancock and Ohio Counties and at a meeting of the stockholders it was announced that several thousand dollars would be spent at once in building up the properties. The following officers were elected: Theodore Tyler, Chicago, president; W. B. McIlvaine, Chicago, vice-president, and L. N. Birk, Owensboro, secretary and treasurer.

## ELECTRICAL SECURITIES.

Trustees of Massachusetts Electric Companies have voted to pay the accrued dividends of seventeen and three-quarters per cent in preferred stock at par on July 1, 1912. This entails the issuance of $3,648,938 additional preferred stock.

Directors of the Pacific Gas & Electric Company for the purpose of converting $10,000,000 of accumulated surplus into capital stock have authorized the issuance of fully paid up common stock to the holders of record November 22 in the proportion of one-half share of new stock for each share of common stock.

The next dividend on Chicago Telephone will be payable December 30 and will go to stockholders of record December 20. American Telephone stock, given in exchange for Chicago Telephone, will be delivered on or before January 23, 1912, and will carry dividend, which begins to accrue on January 1; therefore, no adjustments of dividends will be involved.

The Detroit Edison Company has decided to issue at once $1,500,000 new capital stock. This stock is offered to stockholders of record December 9 at par. At a special meeting of stockholders held November 15 a proposal to increase the capital stock from $9,000,000 to $15,000,000 was ratified and authority given to directors for the issue of the $1,500,000 stock which is now offered.

London advices state that the Rio de Janeiro Tramway Light, Heat & Power Company will immediately issue another $10,000,000 of additional stock, authority for which will shortly be asked from shareholders. This amount would increase the capital of the company from $40,000,000 to $50,000,000.

DIVIDENDS.

Chicago Telephone Company; quarterly dividend of two per cent, payable December 30.

Fort Wayne & Northern Indiana Traction Company; regular quarterly dividend of one and one-half per cent on the preferred stock, payable December 1 to stock of record November 25.

Indianapolis Street Railway Company; semiannual common dividend of three per cent, payable January 2.

Massachusetts Electric Companies; regular semiannual dividend of $2 per share, payable January 1 to stock of record December 2.

Northern Ohio Traction & Light Company; an extra dividend of one-quarter of one per cent on the common stock.

Safety Car Heating & Lighting Company; an extra dividend of one per cent, in addition to the regular quarterly dividend of two per cent on the capital stock, making the total dividend disbursement for the year nine per cent. Payable December 22, to stock of record December 8. Last year an extra dividend of three per cent was declared at this time.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

NEW YORK.

| | Nov. 27. | Nov. 20. |
|---|---|---|
| Allis-Chalmers common | 3⅛ | 3 |
| Allis-Chalmers preferred | 13 | 14½ |
| Amalgamated Copper | 63 | 61¼ |
| Amer. Tel. & Cable | *74 | *74 |
| American Tel. & Tel. | 141⅝ | 138¾ |
| Brooklyn Rapid Transit | 77¾ | 77¾ |
| General Electric | 155½ | 154 |
| Interborough-Metropolitan common | 14⅞ | 15½ |
| Interborough-Metropolitan preferred | 45 | 47⅞ |
| Kings County Electric | 129 | 129 |
| Mackay Companies (Postal Telegraph and Cables) common | 83 | 83 |
| Mackay Companies (Postal Telegraph and Cables) preferred | 72½ | 72¾ |
| Manhattan Elevated | 134¾ | 134 |
| New York & New Jersey Telephone | 103 | 103 |
| Pacific Tel. & Tel. | 48½ | 47½ |
| U. S. Steel common | 64⅛ | 64 |
| U. S. Steel preferred | 109⅛ | 109¼ |
| Western Union | 78 | 77¾ |
| Westinghouse common | 65 | 66 |
| Westinghouse preferred | *114 | *114 |

*Last price quoted.

BOSTON.

| | Nov. 27. | Nov. 20. |
|---|---|---|
| American Tel. and Tel. | 141½ | 138¾ |
| Edison Electric Illuminating | 286 | 290 |
| General Electric | 155 | 154 |
| Massachusetts Electric common | 21¾ | 21⅛ |
| Massachusetts Electric preferred | 94 | 94 |
| New England Telephone | 150 | 149 |

PHILADELPHIA.

| | Nov. 27. | Nov. 20. |
|---|---|---|
| American Railways | 46 | 46½ |
| Electric Company of America | 12 | 11⅞ |
| Electric Storage Battery common | 55 | 53¼ |
| Electric Storage Battery preferred | 55 | 53¼ |
| Philadelphia Electric | 15¾ | 16 |
| Philadelphia Rapid Transit | 24 | 23½ |
| Philadelphia Traction | 84½ | 84 |
| Union Traction | 52⅞ | 51¾ |

CHICAGO.

| | Nov. 27. | Nov. 20. |
|---|---|---|
| Chicago Elevated common | 28½ | 28¼ |
| Chicago Elevated preferred | 92 | 94¼ |
| Chicago Railways, Series 1 | 95 | 95 |
| Chicago Railways, Series 2 | 33¼ | 32½ |
| Chicago Subway | ⅞ | ⅞ |
| Chicago Telephone | 140½ | 123 |
| Commonwealth Edison | 134½ | 134½ |
| National Carbon common | 103 | 102½ |
| National Carbon preferred | 118 | 118 |

## PERSONAL MENTION.

A. W. BURCHARD, of the General Electric Company, is making a three weeks' trip to the Pacific Coast.

C. H. HUBBELL has been appointed superintendent of telegraph of the Rock Island system, succeeding the late G. S. Jennings.

W. WIEN, professor of physics in the University of Würzburg, is, according to recent advices, to be the recipient of the Nobel prize for physics.

S. G. McMEEN was elected president of the Mount Hood Railway & Power Company of Portland, Ore., at a recent meeting of the Board of Directors.

ALONZO BURT, vice-president and treasurer of the Chicago Telephone Company, has been elected a director of the company, succeeding Angus S. Hibbard, resigned.

EDWARD G. ACHESON delivered an address on November 3 before the Faraday Society in London. The address was of informal character and dealt with D. Acheson's researches on electrical furnace products.

JOHN F. GREENWALT, publicity manager for the Mountain States Telephone Company, has been elected president of the Advertising Club of Denver, succeeding Charles H. Babcock, the first head of the organization.

CHARLES R. VAN HISE, president of the University of Wisconsin, recently delivered four lectures at the Lowell Institute of Boston, the first on "Some Aspects of Conservation," on November 15. He also spoke at Harvard University on "Concentration in Industry."

WILLIAM H. McINTYRE has been elected first vice-president of the Manning, Maxwell & Moore Company, of which Henry Evans is chairman of the executive committee. Mr. McIntyre was vice-president of the Equitable Life and lately president of the San Antonio & Arkansas Pass Railroad Company.

C. P. STEINMETZ recently delivered two lectures before the engineering students of the University of Illinois. The subjects were "Unexplored Fields in Engineering" and "The Nature of Electrical Energy." The audience at each lecture crowded the lecture room of the Physics Building, in which the lectures were given.

E. P. CUMMINGS, for some time an engineer in the electrical department of the Denver Gas & Electric Light Company, has been transferred to the Montgomery Light & Water Power Company, of Montgomery, Ala., where he has taken up the duties of general superintendent. Mr. Cummings will have larger opportunities in his new work and his many Denver friends wish him success.

## FOREIGN TRADE OPPORTUNITIES.

(From *Daily Consular Reports*, issued by the Bureau of Manufactures, Washington, D. C. In applying for information mention file number.)

NO. 7596. BIDS FOR NEW ELECTRIC-LIGHT PLANT.—The American vice consul general at Santo Domingo has forwarded a translation of the basis for specifications calling for bids for the installation of a new electric-light plant for the public lighting of the city of Santo Domingo, Dominican Republic, as made public in a recent issue of *El Tiempo* of that city. The bids are to be directed to the office of secretary of the municipality not later than December 15, 1911. The specifications call for a private owned plant, the present municipal plant being considered inadequate and unsatisfactory. Copy of the notice and transmission can be obtained by interested firms upon application to the Bureau of Manufactures.

NO. 7594. DYNAMOS, MOTORS, OIL ENGINES, AND MACHINERY.—The Bureau of Manufactures is in receipt of a communication from a business man in India stating that he desires to purchase from American manufacturers dynamos, motors, oil engines, and machinery. He is anxious to receive from such manufacturers as soon as possible catalogues and full particulars.

NO. 7559. ELECTRIC ROCK DRILLS.—An engineer connected with a contracting firm in Australasia, and who is directing the work on a railway tunnel through certain mountains, informs an American consul that he would be glad to get information concerning American electrically operated rock-drilling machinery. He desires not merely descriptions of such machinery, but also the prices at which it could be furnished at the point of destination.

NO. 7562. AMERICAN RIVER AND TIDE GAUGES.—A report from an American consulate states that an electrical engineer connected with a foreign Government desires information concerning American river and tide gauges. He is especially anxious to know how their prices compare with British quotations. Efficient appliances are needed in connection with prospective water-power development in the country in question.

## LEGAL NOTE.

LIMITATIONS ON RATE REGULATION.—The United States Circuit Court, in Kentucky, says that the legislative department of a state or city may compel a telephone company to charge rates which are reasonable and just, but may not fix rates which are so low as to deprive it of a fair return upon the value of its property which at the time is being used for the public in the

operations of the company within the jurisdiction of the legislative body which attempts to fix rates. Were this not so, property of the company would be used, not for the benefit of its owners, but for that of the public, in which case the property would be appropriated by the public without just compensation, and would be a violation of constitutional rights. Where persons have put their money into property which is used for the public they are entitled, year by year, to earn upon the property so employed a fair return. A company is entitled to be allowed, if it so chooses, to charge those who use its property for their own purposes such reasonable rates as will enable it to earn thereon a fair income whether or not a rival company can do so upon its property. In other words, the charging by a rival company of rates which it has agreed to as a condition precedent to being granted a franchise, while it adds to the risks of the first company's business, cannot affect the right of the latter to be allowed to charge rates which are not confiscatory, but which may yield a fair income upon the value of its property if that property is in fact used by the public.—Cumberland Telephone & Telegraph Company vs. City of Louisville, 187 Fed. R., 637.

## NEW PUBLICATIONS.

PETROLEUMS OF CALIFORNIA.—The physical and chemical properties of the petroleums of the San Joaquin Valley of California are taken up in this publication. An interesting feature of the bulletin is the description of an electric still which was used in making the difficult distillations necessary for a proper analysis.

COPPER IN THE APPALACHIANS.—"Copper Deposits of the Appalachian States," by Walter Harvey Weed, of the United States Geological Survey, is the title of Bulletin 455, just issued by the Survey. Copper ores are found and copper mining has for some time been carried on in many localities in the mountainous region of eastern North America, from Canada to Alabama. The availability of the deposits as a source of copper is frequently discussed, but there are at present but few producing mines.

PRODUCER-GAS INVESTIGATIONS.—The Bureau of Mines has published a résumé of producer-gas investigations which were carried on between October 1, 1904, and June 30, 1910, by R. H. Fernald and C. D. Smith. The work is divided into three parts; the first taking up the general subject of producer-gas and producer-gas plants; the second, reports of investigations at St. Louis and Norfolk, and the third a report of investigations at Pittsburgh. The book is fully illustrated and contains numerous diagrams.

NATIONAL ELECTRIC LIGHT ASSOCIATION PROCEEDINGS.—The proceedings of the thirty-fourth convention of the Association have been bound in two volumes. The first volume includes the general sessions and commercial sessions, giving the papers, reports and discussions. In Vol. II the accounting sessions, technical sessions and power-transmission sessions are covered. The volumes are bound in cloth and are fully illustrated with the diagrams and illustrations originally occurring in the papers presented.

TABLES OF CONSTANTS.—The first volume of the annual Tables of Constants and Numerical Data, Chemical, Physical and Technological, compiled and published by an International Commission, appointed by the Seventh International Congress of Applied Chemistry is now open to subscription. Subscription blanks, the terms of subscription and descriptive leatlets may be obtained from any one of the three American commissioners: G. N. Lewis, Massachusetts Institute of Technology, Boston, Mass.; G. F. Hull, Dartmouth College, Hanover, N. H.; and J. Stieglitz, University of Chicago, Chicago, Ill. After January 1, 1912, the price of the volume is likely to be increased. The volume contains the data published in 1910, collected from all available sources.

## PROPOSALS.

WIRING.—The Rushville Furniture Company, Rushville, Ind., wishes to receive bids for wiring for electric lights, etc., for its new furniture factory.

POWER APPARATUS.—H. C. Peterson, city recorder of Sleepy Eye, Minn., will receive bids until December 15 for one sixty and one seventy-five-kilowatt alternating-current generator with field rheostat and Rockwood patent paper pulley 15 by 12 inch, exciter pulley 8 by 4 inch. Generator should be 200 revolutions per minute, six-pole, 1,200-volt, sixty-cycle, three-phase revolting-field. C.

VENTILATING APPARATUS.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until December 27, for the installation of a heating and ventilating apparatus, etc., for the United States Post Office and Customhouse Building at San Diego, Cal., in accordance with the drawings and specifications, copies of which may be had of the superintendent of construction at San Diego, Cal., or at the Supervising Architect's office.

WIRING—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until January 3 for the construction, complete (including heating apparatus, electric conduits and wiring, and lighting, fixtures), of the United States Post Office at Maryville, Mo. The building is one story and basement and has a ground area of approximately 4,900 square feet. Drawings and specifications may be obtained from the custodian of site at Maryville, Mo., or from the Supervising Architect's office.

## INDUSTRIAL ITEMS.

PETTINGELL-ANDREWS COMPANY, Boston, Mass., has issued the the Holiday Goods Number of *Juice* illustrating many novelties and giving numerous suggestions for Christmas trade. Toys, miniature lamps, heating and cooking devices and several very handsome lamps are among the things listed.

PASS & SEYMOUR, INC., Solvay, N. Y., announces that its Chicago branch office moved on December 1 to 700 West Jackson Boulevard. The move was made necessary by the increasing business of the company and the need for more space. The present quarters are about three times as large as the former ones.

THE AJAX LINE MATERIAL WORKS, South Milwaukee, Wis., is advertising its Ajax insulators, mast arms, sleet-proof pulleys and other Ajax specialties by means of a number of well prepared folders. The specialties are illustrated and prices are given. The phrase "Remember Ajax Quality," is used throughout the printed matter.

THE WESTERN ELECTRIC COMPANY has received from the Lake Erie, Alliance & Wheeling Railroad an order for twenty-two of its selectors, which will be installed on the main line of the road between Phalanx, O., and Dillonville, O. This line is eighty-five miles in length, and the dispatcher will be located in the middle of the line at Alliance, O.

THE VULCANITE PORTLAND CEMENT COMPANY, New York, N. Y., is mailing pamphlets on the subject of "Selection and Proportion of Aggregates for Concrete." While this is the third edition of the previous pamphlet on that subject, it contains, aside from the selection, almost entirely new matter which has been the subject of research work on the part of the writer for a year or more past.

THE GENERAL VEHICLE COMPANY, Long Island City, N. Y., has included as a supplement to the November issue of *Elec-Tricks*, a parade of General Vehicle electrics which took place in St. Louis on Labor Day. Announcement is made of a series of bulletins covering the use of the company's trucks in different lines of trade. The first of these will probably be a bulletin on "G. V. Trucks in Brewery Service."

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, Pittsburgh, Pa., has received an order from the Pacific Mills at Lawrence, Mass., for one twenty-panel marble switchboard for controlling several 2,300-volt alternating-current generators, and also one six-panel switchboard for the control of several heavy capacity direct-current generators. These boards are in addition to boards previously purchased from the Westinghouse Companies, and are to take care of the increased load on the plant handled by this company.

THE WIRT ELECTRIC SPECIALTY COMPANY, Germantown, Pa., describes and illustrates its Di-el-ite resistance units in a recent bulletin. These units are made of a high grade wire or strip completely imbedded in Di-el-ite, so as to prevent oxidation or injury. Di-el-ite is an artificial insulating stone composed principally of cilex or quartz. It has good mechanical strength and will stand a temperature of 800 degrees Fahrenheit. Its insulating properties are such that fixture joints with an insulating layer of only one-sixteenth of the material are tested regularly with 4,000 volts alternating current.

THE FEDERAL SIGN SYSTEM (ELECTRIC), Chicago, Ill., calls special attention in the November number of the *Federalist* to the Federal fixture straightener. The new Federal line of porcelain enameled steel shades is also briefly described. These are made in several styles for outdoor and indoor use, and mark an increase in the field of the corrosion-proof enameled steel that was introduced into the electrical field in a large way in Federal signs. The fixtures are more fully described in Bulletin No. 150, just issued by the company.

THE GENERAL MOTORS TRUCK COMPANY, Detroit, Mich., announces that a distinct department of its selling organization, a service department, has been organized and has been placed under the supervision of T. P. Myers, who has the title of general service manager. The service to a purchaser will begin with a thorough study and analysis of his delivery and hauling requirements, and will continue after the purchase, through prompt and painstaking care in the supplying of repair parts and the maintenance of the troubles. Mr. Myers will be subject to all service demands that may be made.

THE FLOUR CITY ORNAMENTAL IRON WORKS, Minneapolis, Minn., has through its lamp-standard department, issued a very attractive booklet dealing with ornamental street lighting. This company has enjoyed exceptional success in supplying lighting standards for progressive cities installing ornamental street lighting, some of the most prominent of our best-lighted cities being among its customers. Four standards in particular have been extensively employed these being known as the Corinthian, Egyptian, Capitol and Boulevard, the latter being a single-light post particularly adapted, as its name implies, for boulevard and park lighting. The new booklet describes these standards in detail, giving data as to construction and installation and in addition deals with specially designed standards for building lighting.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has received from the Kentucky Traction Terminal Company, Lex-

ington, Ky., an order for complete power equipment. The equipment is as follows: For generating stations at Lexington, two 2,500-kilowatt, turbo-generator sets, one turbo-exciter set, one seventy-five-kilowatt motor-generator set, two 750-kilowatt motor-generating sets, four 33,000-4,000 transformers and a switchboard. For the Versailles substation one 1,200-600-volt rotary; three 33,000-370-volt air-cooled transformers and switchboard. For the Frankfort substation two 1,200-600-volt rotary converters and six 33,000-370 air-cooled transformers with switchboard. For the Paris substation one 1,200-600-volt rotary converter and three 100-kilowatt transformers. For the Nicholsville substation one 1,200-600-volt rotary converter and three 100-kilowatt transformers. For the Georgetown substation, one 1,200-600-volt rotary converter; three 100-kilowatt transformers and a switchboard. Five four-motor car equipments with type "K" control are also to be furnished by the General Electric Company.

THE CUTLER-HAMMER MANUFACTURING COMPANY, Milwaukee, Wis., has just published the following bulletins: No. 10½, describing new multiple-switch starting rheostats made in standard sizes from ten horsepower to 150 horsepower for 110, 220, and 500-volt direct-current service. New types of switches are used on these starters; No. 18, describing alternating-current squirrel-cage primary-resistance motor starters made in capacities fom five to thirty horsepower for 110, 220 and 440-500 volt circuits; Bulletin No. 2145, describing a new multiple-switch starter which, in addition to no-voltage release, is equipped with two new type Cutler-Hammer single-pole overload circuit breakers. Standard sizes are the same as for Bulletin 10½. The compound multiple-switch starter and speed regulator is described in Bulletin 2260. This is made in capacities from ten to 200 horsepower and combines in one panel starting and regulating rheostats. The apparatus described in Bulletin 2270 is like that of Bulletin 2260, except that main-line knife switch and fuses are mounted on the panel so as to facilitate installation. This is called a compound universal motor starter and speed regulator.

THE KERR TURBINE COMPANY, Wellsville, N. Y., advises that over 700 of its machines, aggregating more than 50,000 horsepower, are in active service and that more unfilled orders are now booked than at any previous time in the history of the company. Although the plant has been materially enlarged, a night shift has been necessary for the past two and a half years. Among recent orders are the following: One 350-kilowatt turbo-alternator for the Brooklyn refinery of the Standard Oil company; two 2,800-gallons per minute turbo-pump units for Tidewater Oil Company; two seventy-five-kilowatt and one thirty-five-kilowatt lighting sets to American Shipbuilding Company for the new steamer *City of Detroit:* two seventy-five-kilowatt lighting sets for waterworks service, City of Chicago; one sixty horsepower turbo-generator with Prony-brake attachment for the University of Melbourne, Australia; one 215-horsepower turbo-blower for Peoples Gas Light & Coke Company, Chicago (the tenth set of this size ordered by that company); two underwriter fire pumps driven by 200-horsepower Kerr turbines for Steger & Sons piano factory, Steger, Ill.

### DATES AHEAD.

Los Angeles Electrical Exposition. Los Angeles, Cal., November 25-December 9.

American Physical Society. Regular Thanksgiving meeting, Chicago, Ill., December 2, 1911.

National Gas and Gasoline Engine Trades Association. Annual meeting, Hotel Hollenden, Cleveland, O., December 5-8.

American Society of Mechanical Engineers. Annual meeting, New York City, Dec. 5-8.

American Institute of Chemical Engineers. Annual meeting, Washington, D. C., December 20-22.

American Association for the Advancement of Science. Annual meeting, Washington, D. C., December 27-30.

Western Electrical Inspectors' Association. Milwaukee, Wis., January 23-25, 1912.

National Electric Light Association. Next annual convention, Seattle, Wash., June 10-14, 1912.

National Electrical Contractors' Association. Annual meeting, Denver, Colo. July 17-20, 1912.

The 1912 Boston Electric Show. Mechanics Building, Boston, Mass., September 28-October 26, 1912.

# RECORD OF ELECTRICAL PATENTS.

**Issued (United States Patent Office) November 21, 1911.**

1,009,035. INSULATING MATERIAL FOR EMBEDDING ELECTRICAL CONDUCTORS. Lawrence E. Barringer, Schenectady, N. Y., assignor to General Electric Co. Filed Feb. 5, 1906. Renewed Apr. 8, 1910. Is composed of a fibrous material and hydrous silicate of calcium having a resistance wire embedded therein.

1,009,059. TROLLEY DEVICE. James H. Finch, Jr., West Roxbury, Mass. Filed Dec. 28, 1910. The trolley-wheel harp is secured to the pole by a tubular shell and plug with lugs.

1,009,080. AUTOMATIC SWITCHING APPARATUS. Frank R. McBerty, New Rochelle, N. Y., assignor to Western Electric Co., Chicago, Ill. Filed Sept. 11, 1908. Combined with an automatic telephone selector switch is an automatic sequence-switch, and local reciprocal controlling circuits established in the operation of the selector and sequence-switch adapted to cause each of them to complete a cycle of operations and return to normal condition.

1,009,084. SPARK PLUG. Aldah Robinson Meacham, Oklahoma, Okla., assignor of one-half, to Charles G. Frost, Oklahoma, Okla. Filed Feb. 27, 1911. Comprises a bushing, an insulating sleeve, a rod extending through the sleeve and rotatably mounted therein, a radially extending electrode on the end of the rod and a fixed electrode on the bushing comprising an inturned flange having an eccentric concave edge.

1,009,106. RECEIVING APPARATUS. Harry Shoemaker, Jersey City, N. J. Filed Nov. 3, 1909. A high-frequency wireless receiver has associated with it a guarding apparatus comprising means for selecting energy of undesired frequency, and a resistance sufficient to prevent persistent oscillations in the selecting means.

1,009,120. INCANDESCENT-ELECTRIC-LAMP SOCKET. August Weber, Sr., Schenectady, N. Y., assignor to Weber Electric Co., Schenectady, N. Y. Filed Oct. 1, 1906. Relates to a method of connecting the shell to one terminal of the socket.

1,009,129. METALLIC-FILAMENT LAMP. Ottilie Birnbaum, Vienna, Austria-Hungary, assignor to Westinghouse Lamp Co. Filed Nov. 8, 1910. Has the filaments provided with a kink near their points of attachment to the leading-in wires and intermediate supports, loops of conducting material passing around the kink and being attached to the leading-in wires and intermediate supports.

1,009,133. ELECTROLYTIC APPARATUS. Henry Croston, New York. N. Y., assignor to General Chemical Co., New York, N. Y. Filed July 22, 1909. The cathode-forming mercury in the bottom of the tank is agitated by means of two scrapers arranged to reciprocate horizontally in the tank adjacent to its bottom, and means for causing one of the scrapers to be inoperative during movement in one direction, and the other during movement in the opposite direction.

1,009,134. TELEPHONE TOLL OR PAY STATION. George H. Davis, Worcester, Mass., assignor to Livermore Pay Station Co., Portland, Me. Filed June 10, 1907. Relates to the construction of the coin distributor for various sizes of coins.

1,009,143. ELECTRICAL PRECIPITATOR AND AMALGAMATOR. John Frey, San Francisco, Cal. Filed Nov. 18, 1910. Has an anode comprising a cylindrical cage adapted to be rotated about a horizontal axis, and a trough-shaped cathode below the anode adapted to contain a quantity of material forming the real cathode, and means for vertically moving the axis.

1,009,162. SWITCH FOR SPARKING DEVICES. Frank J. Marrington, Fort Dodge, Iowa. Filed Mar. 6, 1909. A switch for changing from battery to magneto ignition.

1,009,166. RAIL BOND. Humphreys Milliken, New York, N. Y. Filed Feb. 15, 1910. Consists of terminals composed of a series of vertically arranged strands of wire adapted for attachment to the side of the ball of a rail, and a body portion comprising depending continuations of the strands, which are continuous between the terminals.

1,009,172. ELECTRIC SNAP SWITCH. Johann G. Peterson, Hartford, Conn., assignor to Arrow Electric Co., Hartford, Conn. Filed Feb. 1, 1911. Relates to the construction of an indicating shutter for a rotary snap switch.

1,009,182. POLYSTATION LINE-CIRCUIT. Georg Ritter, Stuttgart, Germany. Filed Feb. 12, 1910. A party-line telephone or telegraph system has bridging-resistance relays governing the connection at the subscribers' stations.

1,009,190. TELEPHONE TRUNKING SYSTEM. Charles A. Simpson, Chicago, Ill., assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Filed Apr. 9, 1908. Has a battery at each exchange, the branch-exchange battery being connected to the main-exchange battery through the connecting trunk when the latter is not used for talking, thus keeping the branch battery charged from the main battery.

1,009,229. MOTOR-STARTER SWITCH. William S. Evans, Newark, N. J. Filed Dec. 30, 1910. A three-phase induction motor starter, has a starting resistance in circuit with the motor, a shunt coil, means released by the coil for short-circuiting the resistance at starting speed or half speed and for simultaneously cutting out the shunt coil, and means released by a series coil for cutting out the motor on an overload.

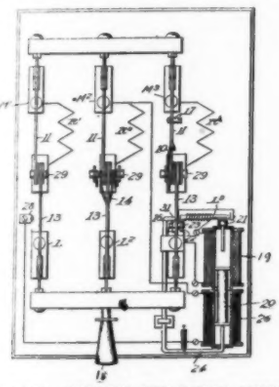
1,009,245. FLOOR-SURFACING MACHINE. John Herr, Lionel Hirst Wood, and Samuel Wilson Heaton, Philadelphia, Pa. Filed Sept. 28, 1906. Renewed Aug. 5, 1911. Is driven by an electric motor.

1,009,291. ARC-LAMP ELECTRODE. Georg Egly, Treptow, near Berlin, Germany, assignor to Gebrüder Siemens & Co., Berlin, Germany. Filed Oct. 22, 1909. Consists of a shell of carbon surrounding a core composed of a mixture of carbon, light-emitting substances, phospho-boric acid, and water-glass.

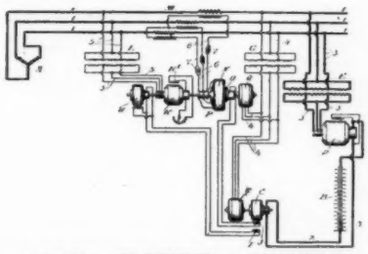
1,009,309. RAILWAY SIGNALING. Lemuel F. Howard, Edgewood Park, Pa., assignor to Union Switch & Signal Co., Swissvale, Pa. Filed Sept. 8, 1909. Combined with a block section is an electric light, a polarizing device for polarizing a beam from the light, means controlled by the condition of the block section as regards occupancy by a train for rotating the plane of vibration of the polarized beam, and an analyzer comprising a polarizing device for receiving the beam.

1,009,310. DYNAMO-ELECTRIC MACHINERY. Albert S. Hubbard, Belleville, N. J., assignor to Gould Storage Battery Co. Filed Feb. 25, 1908. Combined with a dynamo provided with a rotatable armature, a commutator and a rotatable field structure energized by polyphase currents, is an exciting dynamo generating the polyphase currents, and means for rotating the field structure at a speed having a definite relation to that of the armature of the exciting dynamo.

1,009,311. ELECTRICAL SYSTEM OF DISTRIBUTION. Albert S. Hubbard, Belleville, N. J., assignor to Gould Storage Battery Co. Filed May 4, 1908. A polyphase system of distribution includes a machine of the type covered by the preceding patent, a motor-generator set and a rotary converter connected to a storage battery for taking up load fluctuations.



1,009,229.—MOTOR-STARTER SWITCH.



1,009,311.—ELECTRICAL SYSTEM OF DISTRIBUTION.

1,009,316. PNEUMATIC-DISPATCH-TUBE APPARATUS. Chester S. Jennings, Boston, Mass., assignor to Lamson Consolidated Store Service Co., Newark, N. J. Filed May 9, 1907. An electric motor drives the air pump and is electrically controlled in accordance with variation of the air pressure.

1,009,317. DETECTOR FOR WIRELESS SIGNALING APPARATUS. Maurice Bernays Johnson, San Antonio, Tex. Filed Oct. 6, 1910. Includes a mineral substance mounted between a contact and an adjustable leaf spring.

1,009,320. HEATING AND POWER PLANT. Joseph Moses Ward Kitchen, East Orange, N. J. Filed Dec. 4, 1908. Comprises a gas producer, a gas engine, a heat absorbing, distributing and radiating system, an electric generator driven by the engine and means for generating electricity from the waste heat of the engine.

1,009,338. AUTOMATIC GAS-PRESSURE ALARM. Earl Ransom Perkins, Cleveland, Ohio. Filed Jan. 7, 1908. Renewed Mar. 14, 1910. Has an electric alarm controlled by a contact on a rubber tube.

1,009,345. ELECTROMAGNETIC SIGNALING INSTRUMENT. Stanislaus H. Sauvé, Denver, Colo. Filed June 18, 1910. Has a coil, a stop or support in axial line with such post, and a ball armature located between the stop and post and designed to vibrate between them under electric excitement.

1,009,354. APPARATUS FOR HEATING WATER. Alexander Trepreau, Joinville-le-Pont, France. Filed Feb. 18, 1911. Comprises a cylinder, a head thereon adapted to be connected to a water tap and having a downwardly tapering duct, a number of non-conducting water tubes connected to form a continuous tube, resistance coils in circuit on the tubes and a flexible connection between the head and tubes.

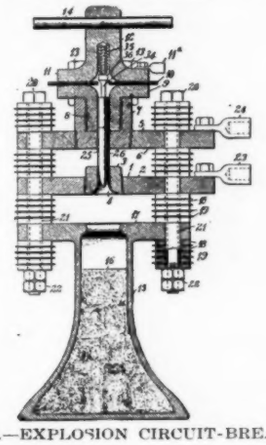
1,009,357. COMBINED TROLLEY-POLE BASE AND CATCHER. Herbert E. Vail, Salt Lake City, Utah, assignor of one-third to Walter R. Andrew and one-third to Edward C. Parsons, Salt Lake City, Utah. Filed Feb. 7, 1911. Includes a set of jointed bars serving to lock the pole when abnormal upward movement thereof occurs.

1,009,370. AUTOMATIC ELECTRIC COUPLING MECHANISM. Morris Wuerpel, St. Louis, Mo., assignor to Westinghouse Automatic Air & Steam Coupler Co., St. Louis, Mo. Filed Apr. 17, 1907. Comprises in combination, a coupler head, automatic means for coupling the head, a base plate carrying a plurality of contact connections, the contact connections comprising a vertical row of male contacts, and an adjacent vertical row of female contacts, each pair of contacts being on the same horizontal plane.

1,009,386. EXPLOSION CIRCUIT-BREAKER. Harry P. Davis, Pittsburgh, and Ford W. Harris, Wilkinsburg, Pa., assignors to Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Filed Nov. 30, 1908. The current passes through a hollow cartridge seated in the two terminals of the breaker. When the current becomes too high the cartridge is heated to its explosion point, the explosion projecting the lower part of the fuse into a bed of sand contained in the base of the device.

1,009,400. AUTOMATIC POWER CONTROL FOR PNEUMATIC-DESPATCH APPARATUS. Edmond A. Fordyce, Boston, and Chester S. Jennings, Brookline, Mass., assignors to Lamson Consolidated Store Service Co., Newark, N. J. Filed Mar. 9, 1906. A number of motors driving air pumps are connected to the power line through a starter operated by an air piston. As the air pressure falls the piston-operated switch starts the motors as they are needed to maintain constant pressure.

1,009,401. ELECTRICAL PULL SOCKET. Edgar H. Freeman, Trenton, N. J., assignor to E. H. Freeman Electric Company,



1,009,386.—EXPLOSION CIRCUIT-BREAKER.

Trenton, N. J. Filed June 2, 1911. Comprises a body, a snap-switch including a rotary rectangular switch block, and a snapper spring consisting of a doubled spring plate housed within the switch body and exposed longitudinally thereof parallel with the axis of the block, one leg of the plate having a fastening connection with the body and the other leg having at its free terminal a flat bearing plate engaging the switch block laterally.

1,009,426. MOLD FOR ELECTRICAL-CONSTANT BANKS. George W. Lorimer, Piqua, O. Filed Apr. 24, 1907. A mold for annular castings has channels on its inner wall for holding clips and an outer wall for holding the alternative ends of the clips.

1,009,458. COUPLING. William W. Abbott, Ingram, Pa. Filed Apr. 14, 1911. A detachable device for holding a shade on an incandescent lamp.

1,009,476. CIRCUIT CONTROLLER. John P. Coleman, New York, N. Y., and Per Utne, Wilkinsburg,, Pa., assignors to Union Switch & Signal Co., Swissvale, Pa. Filed Mar. 10, 1911. Includes a contact-operating member biased to one controlling position and adapted to be moved in opposite directions therefrom to two other controlling positions; a motor armature adapted to be rotated in opposite directions; and mechanism interposed between the armature and the contact operating member.

1,009,494. VAPOR-RECTIFIER SYSTEM. Samuel Ferguson, Schenectady, N. Y., assignor to General Electric Co. Filed Sept. 25, 1905. The combination of a rectifier having a cathode and a number of anodes, means for producing arcs between the anodes and cathode, impedance paths in shunt with the arcs, these paths including a reactance common to both.

1,009,518. MAGNET FRAME FOR MAGNETO GENERATORS. Gottlob Honold, Stuttgart, Germany, assignor to Robert Bosch, Stuttgart, Germany. Filed July 7, 1910. Has a magnet frame comprising a cylindrical armature casing of relatively soft, non-magnetic material with openings at the sides, a field magnet having pole pieces projecting closely within the openings, and

end flanges on the casing forced into close contact with the end faces of the pole pieces to tightly lock the parts together.

1,009,549. ELECTRIC COOK-STOVE. Eric Moss, Kingsburg, Cal. Filed Aug. 14, 1911. The stove containing the heating unit and cooking utensil is made with a vacuum wall.

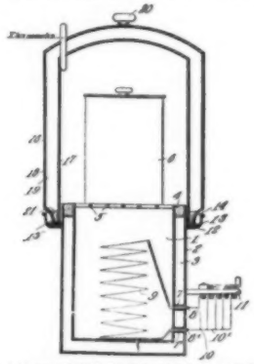
1,009,565. INCANDESCENT-LAMP SOCKET. Clarence D. Platt, Bridgeport, Conn. Filed Dec. 20, 1910. Has a ratchet provided with independent conducting and independent non-conducting teeth, a pawl upon the actuator directly engaging the teeth. Means are provided for moving the actuator, and a spring contact member bears upon the periphery of the ratchet forming a detent to prevent retrograde movement.

1,009,566. CHAIN GUIDE FOR PULL SOCKETS. Clarence D. Platt, Bridgeport, Conn. Filed Dec. 23, 1910. The guide is formed of a flat piece of metal bent in the shape of a tube.

1,009,608. ELECTRODE. Ezechiel Weintraub, Lynn, Mass., assignor to General Electric Co. Filed June 2, 1911. Has a flexible metallic braided sheath containing oblong pieces of magnetite, set end to end.

1,009,614. INCLOSED FUSE. Gilbert Wright and Frederick H. Weston, Schenectady, N. Y., assignors to General Electric Co. Filed June 21, 1911. Combines a tubular fusible member, contact terminals, and connectors each consisting of a pair of sheet metal T-shaped parts bent to form a ring about the end of the fusible element with the arms disposed on opposite sides of the terminal.

1,009,625. ELECTRIC FURNACE. William C. Arsem, Schenectady, N. Y., assignor to General Electric Co. Filed Aug. 18, 1909. Has an air-tight envelop, a heating chamber within the envelop, a closed crucible situated in the chamber, a closed receptable within the envelop for receiving vaporized material and means for conducting vapors from the crucible to the receptacle.



1,009,540.—ELECTRIC COOK STOVE.

1,009,630. INSULATING COMPOUND. Lawrence E. Barringer, Schenectady, N. Y., assignor to General Electric Co. Filed Aug. 16, 1905. A stone-like insulating material consisting principally of asbestos and a silicate of an alkaline earth metal, formed by steam treatment under pressure, the binder being in excess of any free lime or silica present.

1,009,636. APPARATUS FOR USE IN THE DISTRIBUTION OF ELECTRIC CURRENTS. George Berry, West Drayton, England, assignor to General Electric Co. Filed May 6, 1911. Includes a main transformer having its primary winding connected across the supply mains, connections between the secondary winding of said transformer and the distributing mains, a spare transformer, and a supplementary transformer.

1,009,637. STREET-INDICATING DEVICE FOR TROLLEY SYSTEMS. William C. Bisell, Wardner, Idaho. Filed Feb. 19, 1910. Depending fingers supported by the trolley make contact with a collar on the trolley pole. This closes the indicating circuit.

1,009,643. SPARK-PLUG PROTECTOR. Arthur R. Bullock, Cleveland, O. Filed Feb. 29, 1908. A metallic protecting body is adapted to be applied to the outer end of the plug and to inclose the outer end of the shell of the plug. A ring or annular washer of insulating material is carried by the body and projects inwardly therefrom.

1,009,648. ELECTRIC SWITCH. William Henry Chambers, Baltimore, Md., assignor of one-half to Alexander Hamill, Baltimore, Md. Filed May 20, 1907. Renewed Feb. 10, 1911. A pair of contact levers pivoted at one end are worked by a toggle-joint arrangement. A push on a handle causes the switch to close by throwing the levers outward, while a pull causes a double break and brings the arms against an insulating block.

1,009,659. ELECTRICAL ATTACHMENT PLUG. Walter C. Fellows, Philadelphia, Pa., assignor to Keller Manufacturing Co., Philadelphia, Pa. Filed Dec. 22, 1910. Is formed in two parts secured together face to face and provided with recesses for the electrical connections. An attachment piece has a tapered opening communicating with the interior of the plug, and is provided with attaching devices extending between the meeting faces of the plug members. A split clamping bushing is mounted in the said tapered opening.

1,009,660. APPARATUS FOR ASSAYING ORE. Benjamin Fulton Gardner, Chicago, Ill. Filed Sept. 6, 1910. The assay is determined by a resistance measure of the ore.

1,009,663. ALTERNATING-CURRENT MOTOR STARTER. William H. Gaulke, Milwaukee, Wis., assignor to Independent Electric Manufacturing Co. Filed Oct. 19, 1910. Has a magnet for holding the arm in running position combined with an adjustable stop for determining which contact shall be the running contact.

1,009,666. ELECTRICAL SYSTEM OF DISTRIBUTION. Albert S. Hubbard, Greenwich, Conn., assignor to Gould Storage Battery Co. Original application filed Feb. 25, 1908. Divided and this application filed July 1, 1911. Combines a main distributing circuit, a battery and booster armature in operative revelation thereto, and a field structure for the armature which is energized by altenating currents.

1,009,689. TELEPHONE INSTALLATION. Auguste Pictet, Geneva, Switzerland. Filed Sept. 9, 1911. Has an electric-control device for controlling an auxiliary circuit, and means on the connection exchange station for setting the control device in operation when the subscriber's station calls up during the time elapsing before the completion of speaking connections.

## REISSUE.

13,316. ELECTROLYTIC PROCESS OF PRODUCING COMPOUNDS. Charles E. Acker, Ossining, N. Y., assignor to the Nitrogen Co. Filed Sept. 14, 1911. Original No. 914,100, dated Mar. 2, 1909. Consists in continuously electrolyzing a molten compound of a metal, alloying the separated metal with a cathode metal, removing the allow and reacting on the metal so alloyed with the cathode metal with production of an intermediate compound, supplying a separate reagent and reacting therewith on the intermediate compound, with production of the desired compound, and returning the residual metal to the cathode.

## PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office) that expired November 27, 1911:

529,688. MEANS FOR SUPPORTING MOTORS IN ELECTRIC MOTORS. Walter S. Adams, Philadelphia, Pa.

529,704. CLOSED-CONDUIT ELECTRIC RAILWAY. Charles G. Burke, Brooklyn, N. Y.

529,710. SECTIONAL THERMO-ELECTRIC GENERATOR. Harry B. Cox, Hartford, Conn.

529,711. THERMO-ELECTRIC GENERATOR. Harry B. Cox, Hartford, Conn.

529,759. ELECTRICAL SIGNAL FOR RAILWAY CROSSINGS. Daniel W. Smith, St. Louis, Mo.

529,784. COMMUTATOR BRUSH FOR DYNAMOS. George Forbes, London, England.

529,797. CLOSED CONDUIT FOR ELECTRIC RAILWAYS. Frederick L. King, Chicago, Ill.

529,818. TELEPHONE. Alfred Stromberg and Androv Carlson, Chicago, Ill.

529,820. TELEPHONE SWITCH. Edgar S. Combs, Rochester, N. Y.

529,826. CONDUIT ELECTRIC RAILWAY. Leonidas C. Pressley, San Francisco, Cal.

529,894. SIGNALING APPARATUS FOR TELEPHONE-EXCHANGE SYSTEMS. James H. Cary, Malden, Mass.

529,898. ROTATABLE ELECTRIC CONTACTOR. John W. Curry, Cairo, Ill.

529,918. ALTERNATING-CURRENT GENERATOR. John F. Kelly, Pittsfield, Mass.

529,920. SIGNAL FOR CABLE RAILWAYS. Gottfried F. Klaffky, and Frank Faltinowsky, New York, N. Y.

529,938. ELECTRICAL RECORDING DEVICE FOR SAFES. Robert A. Newlyn, Cincinnati, O.

529,949. ELECTRICAL DANGER-SIGNALING SYSTEM. William A. Phillips, U. S. Army.

529,984. ELECTRIC SIGNAL APPARATUS. Horace E. Walter, Richfield Springs, N. Y.

529,985. ELECTRIC SIGNALING APPARATUS. Horace B. Walter, Richfield Springs, N. Y.

529,992. CONDUCTOR-COIL FOR ARMATURES AND FIELD MAGNETS AND METHOD OF MAKING SAME. Emra W. Alexander and Henry Groswith, Philadelphia, Pa.

530,004. ELECTRICAL-CONTACT MECHANISM. John F. Blake, New Haven, Conn.

530,019. BOX OR FURNACE FOR ELECTRIC HEATING APPARATUS. Charles L. Coffin, Detroit, Mich.

530,021. METHOD OF ELECTRICALLY HEATING METAL. Charles L. Coffin, Detroit, Mich.

530,032. ELECTRIC ELEVATOR MOTOR. Wendell C. Fletcher, St. Louis, Mo.

530,033. SUPPLY SYSTEM FOR ELECTRIC RAILWAYS. Zebulon Foster, Chicago, Ill.

530,053. ELECTRIC ROBE, TOWEL, ETC., FOR HEATING. Henry G. O'Neill, Boston, Mass.

530,066. PLUG AND RECEPTACLE FOR ELECTRICAL PURPOSES. David J. Cartwright, Boston, Mass.